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ABSTRACT

Presented are the proceedings of a conference dealing with individualizing instruction for the deaf through greater use of educational media to permit the deaf student to progress at a maximum learning rate. Included are a report on the year's activities of Media Services and Captioned Films, and keynote addresses by James J. Gallagher on the organization of the educational establishment and by Gabriel Ofiesh on educational technology. Discussion papers deal with individually prescribed instruction, planning for individualized instruction of deaf students at NTID (Rochester, N.Y.), mediated self instruction, computer assisted instruction, mathematics curriculum supported by computer assisted instruction, use of programed instruction with emotionally disturbed deaf boys, and the role of media. A discussion summary and the conference program and roster are also included. (KW)

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INDIVIDUALIZING INSTRUCTION FOR THE DEAF STUDENT

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SYMPOSIUM
on
Research and Utilization
of Educational Media for
TEACHING the DEAF

INDIVIDUALIZING INSTRUCTION FOR THE DEAF STUDENT

INDIVIDUALIZING INSTRUCTION FOR THE DEAF STUDENT

MIDWEST REGIONAL MEDIA CENTER for the DEAF

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SYMPOSIUM ON RESEARCH AND UTILIZATION OF EDUCATIONAL MEDIA FOR TEACHING THE DEAF

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"Individualizing Instruction for the Deaf Student"

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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National Conference
Sponsored By The

University of Nebraska
Department of Educational Administration
Teachers College

and

MIDWEST REGIONAL MEDIA CENTER FOR THE DEAF
Lincoln, Nebraska

March 17-19, 1969

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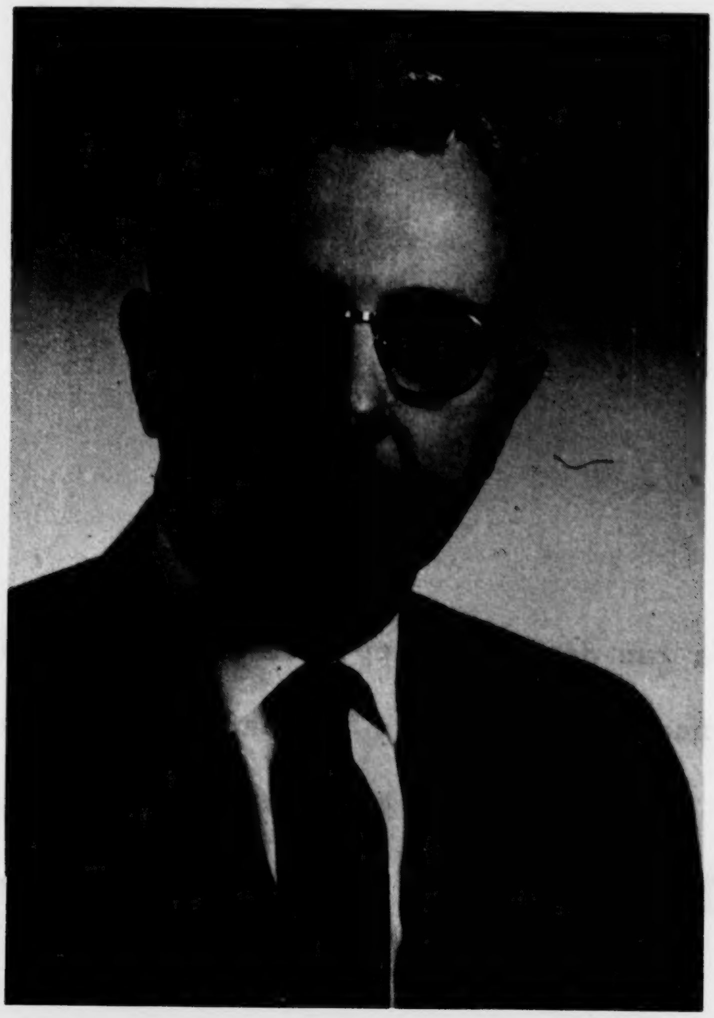
If a man does not keep pace with his companions,

Perhaps it is because he hears a different drummer.

Let him step to the music which he hears,

However measured or far away.

Henry David Thoreau



Robert E. Stepp, Ph.D., Director of the Midwest Regional Media Center for the Deaf, is Professor of Educational Administration, Teachers College, University of Nebraska. This Center, one of four in the United States, was established in September of 1966 at the University of Nebraska by Media Services and Captioned Films, Bureau of Education for the Handicapped, U.S. Office of Education, Department of Health, Education and Welfare. The staff at the Center designs and produces instructional materials for use in teaching deaf students. This symposium is one of the activities administered by the Center.

Dr. Stepp has conducted research in utilization of 8mm sound films to teach speechreading to deaf children. Articles describing this research may be found in the March 1966 issue of Audiovisual Instruction and the June 1966 issue of Volta Review.

Dr. Stepp has been active in both state and national audiovisual organizations. He has been a member of the Board of Directors of the Department of Audiovisual Instruction, N.E.A., a member of its executive committee and on the editorial board of Audiovisual Instruction. He is currently on the National Advisory Committee to the 14 Regional Instructional Materials Centers for Special Education, under the Bureau of Education for the Handicapped. Dr. Stepp is listed in the National Register of the Educational Researchers published by Phi Delta Kappa.

Dr. Stepp has an A.B. degree from Central College (Missouri); a M.A. from the State University of Iowa, and his Ph.D. from the University of Nebraska.

FOREWORD

The fifth annual Symposium on Research and Utilization of Educational Media for Teaching the Deaf was held at the Nebraska Center for Continuing Education, University of Nebraska, Lincoln, Nebraska, March 17-19, 1969. This national conference was sponsored by the Department of Educational Administration, Teachers College, University of Nebraska, and Media Services and Captioned Films, U. S. Office of Education, Department of Health, Education and Welfare. The general theme this year was "Invidualizing Instruction for the Deaf Student."

This topic has extreme significance for the deaf student's future growth and development. Most of our current educational procedures envision the student as a recipient of the instruction given to him by his teacher. The concern, dedication and devotion of teachers of the deaf have for years been one of the major strengths in this complicated and difficult task. On the other hand, the teacher-dominated instructional procedures have caused the deaf learner to become highly dependent on adult educators at a time when he should be acquiring independence. How do you free a handicapped child to learn? One path to freedom lies in planning and utilizing independent study; another path to freedom lies in designing and prescribing individualized instruction. It is to the latter route that this conference directed its attention.

The visitor to many classrooms of the deaf quickly notes that frequently the teacher is more actively involved in the learning experience than is the student. Because of communications limitations, deaf students are usually clustered around their teacher and share in the lesson on a "take-your-turn" basis. Many "dialogues" and "discussions" between the teacher and students are actually monologues in which the teacher functions as a mediator or communicating link between the students. This process gives the teacher an illusion of exciting communication activities when in reality the students are frequently passive, silent and waiting.

What level of achievement could the deaf student reach if he were learning 100% of the time in school? How would programmed learning, computer-assisted instruction, and a systems approach to learning accelerate his intellectual development? How much responsibility can the deaf student assume for his own education if his educational program is tailored to his personal needs? What further accomplishments could be achieved if the instructional program was designed to be "carried" into the home on a planned, coordinated basis.

Educators need to make a definitive distinction between independent study and individualized instruction. Any program that the student studies by himself is independent study, even though every student in his class proceeds through the same identical sequence. This is not individualized instruction. Individualized instruction, on the other hand, may require group actions and activities. Truly individualized instruction means that each child is proceeding on his own learning continuum as designed and prescribed for him by his teacher-mentor who not only selects the content to be studied, but also the method, the mode, the manner and the conditions under which this learning experience is to take place. Each program should be distinct and planned to capitalize on the student's capabilities, utilizing these strengths into independent pursuits, rather than developing teacher dominated programs which stress weakness and approach the child through his disability.

It is my contention that the handicapped student will never achieve his full educational potential until we as educators learn to design and plan instructional programs which will permit the exceptional student to progress at his maximum learning rate. Today educational technology offers the unlimited opportunity for the deaf learner to become truly a student.

Keynote addresses were presented by Dr. James Gallagher, Associate Commissioner of Education for the Handicapped, U.S. Office of Education; and Dr. Gabriel Ofiesh, Director, Center for Educational Technology, Catholic University. Discussion papers were prepared and presented by Dr. John Yeager, Assistant Director, Learning Research and Development Center, University of Pittsburgh; Dr. E. Ross Stuckless, Director, Research and Training for NTID, Rochester Institute of Technology; Dr. S. N. Postlethwait, Department of Biological Sciences, Purdue University; Mr. G. H. Rathe, Jr., Director of Education, Data Processing Division, IBM, White Plains, N.Y.; Dr. Thomas Behrens, Director, Kendall School for the Deaf, Mr. Leland Clack, Kendall School for the Deaf; Mr. Robert K. Lennan, California School for the Deaf; and Dr. Donald Perrin, Department of Instructional Technology, University of Southern California. In addition the conference opened with a special report on the year's activities and projects of Media Services and Captioned Films. Mr. Gilbert Delgado, Acting Chief, Media Services and Captioned Films; Mr. Malcom Norwood, Acquisitions Officer, Media Services and Captioned Films; Dr. Glenn Pfau, Assistant Director, Project LIFE, Dr. Raymond Wyman, Director, Northeast Regional Media Center for the Deaf; Dr. William Jackson, Director, Southern Regional Media Center for the Deaf; and Dr. Marshall Hester, Director, Southwest Regional Media Center for the Deaf gave these reports. The addresses, discussion papers and reports complimented each other and provided a unifying force of attack on this critical problem of individualizing instruction.

Thanks and appreciation are also extended to the Chairmen of the various sessions: Dr. Frank Withrow, Dr. Herbert Arkebauer, Mr. Bill Blevins, Mrs. Dorothy Beal, Miss Josephine Carr, Dr. Lloyd Graunke, Mr. Lloyd Harrison, Mr. Kenneth Huff, My Myron Leenhouts, and Mr. George Thompson. Special mention should be made of the efficient conference staff: Mr. Norman O. Anderson, Dr. Barbara Beggs, Dr. C. Joseph Giangreco, and Dr. John Wiley, who were recorders; Mrs. Marjorie Clere, Mrs. Fannie Lang, and Miss Janet Bourne, who were interpreters; Mr. George Propp, Symposium Editor; Mr. Bill Bowmaster, Conference Coordinator; and Mrs. Marcia Carlson, Secretary.

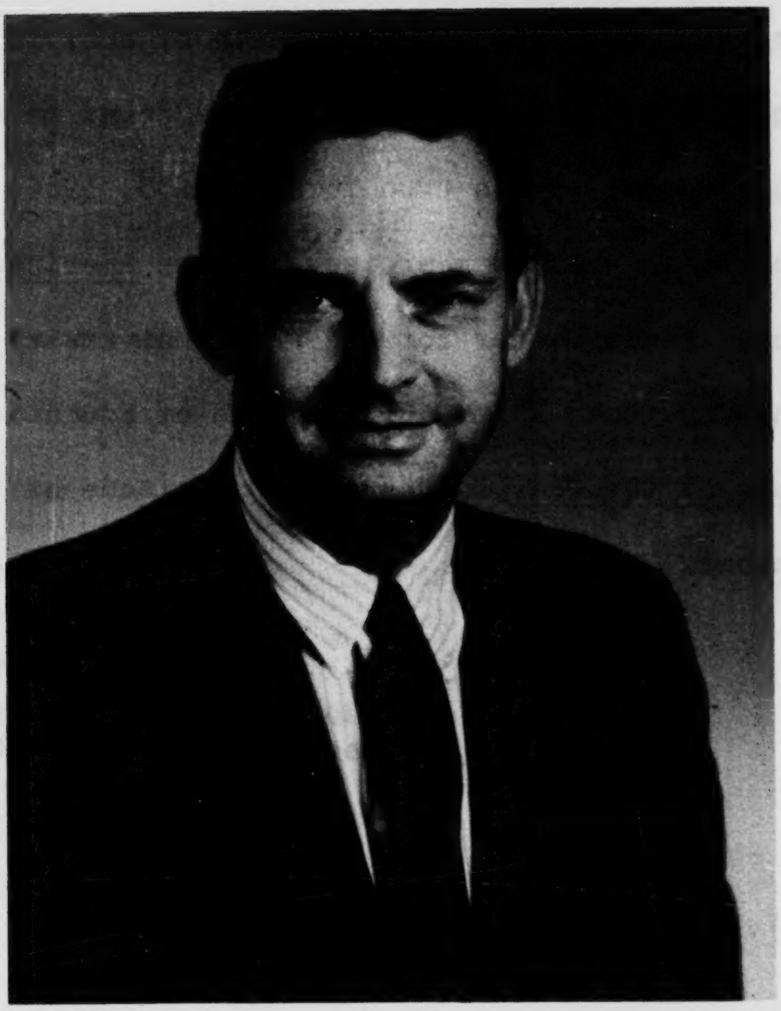
A unique feature of the program was a display of teaching machines and programmed learning materials which had been developed under the sponsorship of Media Services and Captioned Films. Other types of materials produced by the four Regional Media Centers were also on display.

Special recognition should go to Mr. Gilbert Delgado, Acting Chief, Media Services and Captioned Films, and to Dr. Frank Withrow, Director, Division of Educational Services, Bureau of Education for the Handicapped, for their wise counsel and support. The conference staff and participants are most grateful to Media Services and Captioned Films for providing the grant which made the symposium possible. More than one hundred and seventy-five educators of the deaf took advantage of this meeting by participating in the conference.

At the banquet on Monday evening a special and well-deserving tribute was given to Dr. John Gough, formerly Chief, Media Services and Captioned Films. Dr. Gough was the first administrator to be eomployed to direct this program from its inception in 1958 until his retirement in 1969. The growth of media services to the deaf and the national acclaim and praise which has been bestowed upon this program is in direct proportion to the excellent leadership that he provided. The educational programs for the deaf will be indebted to his wisdom and direction for many decades.

The addresses and discussion papers are reproduced in the order that they were presented at the conference. The schedule of activities is printed in Appendix A. A roster of the participants may be found in Appendix B. The report of this conference, as was true for the 1965, 1966, 1967, and 1968 Symposia, will appear in the November issue of the American Annals of the Deaf. The Midwest Regional Media Center for the Deaf, University of Nebraska, and Media Services and Captioned Films, U.S. Office of Education are indebted to the American Annals of the Deaf for devoting one issue of their journal to this symposium report.

Dr. Robert E. Stepp, Director
Midwest Regional Media Center for the Deaf



Mr. George Propp, Assistant Director for Instruction, Midwest Regional Media Center for the Deaf, is a graduate of the Nebraska School for the Deaf. Mr. Propp obtained his B.A. and M.A. from the University of Omaha, and more recently received an M.A. in Educational Administration from San Fernando Valley State College as a participant in the Leadership Training Program in the Area of the Deaf. He is currently a doctoral candidate at the University of Nebraska.

Mr. Propp has been a teacher of the deaf for nearly twenty years, all at the Nebraska School for the Deaf. In addition to his high school teaching duties, which covered several subject areas, he was also varsity athletic coach.

Formerly editor of the NSD school paper and a member of the editorial staff of the Deaf American, Mr. Propp has written many articles of a journalistic nature. He is a member of several professional organizations, Secretary-Treasurer of the National Association of the Deaf and Publicity Director for the World Games for the Deaf Committee of the American Athletic Association of the Deaf.

INTRODUCTION

George Propp
Assistant Director/Instruction
Midwest Regional Media Center for the Deaf

When people attempt to speculate about the years ahead, 2000 A.D. is almost inevitably regarded as some sort of mystical milestone on the time line of our future. Time was when the dawn of the twenty-first century was very remote and most of us had little expectation of living that long. Time flies, as the saying goes, and it is a bit startling to realize that the children we now have in school will be at the peak of their fulfillment when we flip the calendar to the new century. We don't really know what 2000 A.D. has in store for us, but nearly everyone agrees that the next three decades will bring phenomenal changes to society and to the world we live in. The question then is whether our schools are providing the current generation of children with the education needed, not only to cope with the anticipated changes, but to control and direct them. Schools must change to meet the needs of coming generations, and to structure and direct educational changes has been the purpose of this lengthening series of Nebraska Symposia.

Those of us who educate the deaf have a splendid tradition to uphold. There are many things that we can be proud of, but at the same time one cannot hope to remain blind to the well-documented fact that educational achievement of deaf learners is far short of what is needed in order to cope with our complex and rapidly changing society. Many changes have taken place in the education of the deaf during the past few years. These changes will continue and, in all liklihood, will be accelerated. The desire and needs for educational reform is manifested in many ways, and the problems of educating the hearing handicapped are being attacked on many fronts. One of the assumptions of the 1969 Symposium on the Research and Utilization of Educational Media for Teaching the Deaf was that a great deal of hope for future developments lies in the province of individualizing instruction.

Instruction of the deaf has over the years perhaps been more highly individualized than in regular school programs. It has long been recognized that certain aspects of teaching the deaf require an individualized approach. Our seven-to-one pupil-teacher ratio has long been the envy of regular school teachers who have to deal with groups of thirty. While the opportunity to practice individualized instruction has been broad, we perhaps have not taken full advantage of these opportunities, and much of the instructional strategy we employ with a class of seven students is similar to that used by a public school teacher with thirty children. In other words, we have possibly been remiss in our responsibility to develop resources and strategies to fit our unique needs.

Historically, individualized instruction is not a recent phenomena. Much of our out-of-school learning is acquired in this way, and before the formal organization of schools, all knowledge was handed down from one generation to another in this way.

Louis Terman, the eminent learning psychologist, in 1919 suggested that each student be permitted to "progress at the rate which is normal for him, whether that rate be rapid or slow". His concept of measuring out work for each child in proportion to his mental ability focused attention on the extremes of giftedness and slow learning. Terman, furthermore, went beyond the concept of pacing instruction. He was one of the first to propose differentiated courses of study. His thinking gradually gained support and by the 1930's schools were gradually adjusting their courses of study to the needs of rapid and slow learners. Ability grouping was the commonest method of providing for individual differences.

One of the biggest boosts for individualized study was the well-known Winnetka (Illinois) Plan reported in 1934. The Winnetka School System developed an elaborate and sophisticated operation that entailed new content and the development of specialized materials. The scope of the program was

that it worked, it saved time, it made school a happier place for both teacher and learner, and it made possible the recognition of individual differences. The Winnetka Plan was so convincing that one wonders why the experiment did not have greater impact and that today we are still talking about what had already been accomplished in 1934. The major drawback was that in 1934 we did not have the technology to develop the necessary materials and resources to make system-wide change.

Today, developments in educational technology have given individualized instruction new impetus, and nearly everybody to some degree now worships at the shrine of individualization. In our education structure, individualization of learning is taking many forms. This includes such innovations as departmentalization, elimination of grade grouping, team teaching, employment of paraprofessionals or teacher aides, programmed learning, language laboratories, programs for the gifted, and things like that.

All of these innovations contribute something toward individualization, but the ideal program does not at this time exist, and it probably never will. It should be noted that as public schools become more monalithic and more costly, as many forces are working against individualization as are working in support of it.

In the education of the deaf we possess unique circumstances which make it possible for professionals in this field to establish learning programs that would be models of individualized instruction. More than in any other area of education we possess the capability of breaking out of the lock-step pattern of schooling and move into a stage of development where the hearing handicapped child will receive a special education, not because he is deaf, but because he is a special individual. We should do this, not necessarily because the opportunity exists, but because the need is so great. We must make the decision now as to whether or not the deaf person is going to be a fully participating member of society in 2000 A.D.

Individualized instruction means different things to different people. It is a complex process with behavioral, psychological and social implications. Most of the professional literature on individualizing instruction relates to general education. Educators of the deaf looking for a working definition must do so within their own frame of reference, which, incidently, is one of the anticipated outcomes of the 1969 Nebraska Symposium. While we can look to general education for guidelines, developing and implementing the concept of individualized instruction in the education of the deaf will have to be done, directly or indirectly, by people such as those assembled at this Conference.

Participants in the 1968 Nebraska Symposium will have little difficulty in relating Conference papers and discussions to the principles of individualized instruction stressed in general educational literature. The Symposium generally supported writers like Richard S. Crutchfield[1] who gives us three sources of the increased demand for individualed instruction.

The pedagogical source:

> *"The pedagogical reason stems from the enormous effort currently directed at educational reform. The aims of raising academic standards, of maximizing the potential of gifted students, of helping the handicapped and underprivileged, and of stimulating the under-achiever, all point toward the need for improved methods of instruction in which the individual becomes the focus of attention. . . . In order that any bit of instructional information--no matter how small--be properly understood and mastered by the individual, he must be enabled to assimilate it relevantly to his own cognitive structure, to transform it according to his own preferred and distinctive cognitive style, in such a way as to 'make it his own'. This requires individualized instruction that is geared to the distinctive attributes, needs, and cognitions of the particular person."*

The motivational source:

> *"A second major source of the demand for individualized instruction is motivational. There is acute need for ways to preserve the student's sense of individual identity in the sea of anonymity flooding the large-scale educational institutions of today. . . . What he earnestly wants and seeks is the opportunity for learning experiences which are meaningful to him, in which he is meaningfully engaged with the teacher and the subject matter; in short, he want individualized instruction."*

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[1] Crutchfield, Richard S., "Instructing the Individual in Creative Thinking", New Approaches to Individualizing Instruction, A Conference Report, Educational Testing Service, Princeton, New Jersey, 1965.

The social source:

> *"A third major cause of the increased need for individualized instruction is social. It has to do with the changing nature of man's future world. The aims of educational training today must reflect the needs and purposes of tomorrow. I believe that the nature of man's tomorrow is such as to require greater and greater stress on individualized instruction today. . . . Automation, the high-speed computer, and other technological advances will render superfluous a great part of today's routine labor and even routine skills and intelligence. . . . The information explosion will multiply the sum total of human knowledge many-fold and will make obsolescent many of the facts and concepts of today."*

Individualized instruction is basically a person-to-person relationship between teacher and student in order to release the full potential of the learner. No specific thing makes for individualized instruction. A teacher can individualize with the traditional chalkboard and textbook. By the same token, a child being tutored by the most sophisticated machines is not necessarily acquiring individualized instruction. Nor are a student and teacher in a one-to-one situation necessarily employing individualized instruction. Media is a powerful force in individualization, but the total concept goes much deeper than hardware and software. Programmed Instruction, for example, is usually the epitome of homgeneity and the antithesis of individualization, but for the deaf student, who is the only child in a class who is able to master Calculus, Programmed Instruction can become an individualizing force.

This, then, raises the question of how does one know when he or she is achieving individualization. For the answer to this query, the reader is referred to DeHaan and Doll[2] who give five general principles of individualization as follows:

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[2] DeHaan, Robert F., and Doll, Ronald C., "Individualization and Human Potential", Individualizing Instruction, ASCD Yearbook, Association for Supervision and Curriculum Development, Washington, D. C., 1964.

1. *In individualizing teaching, the emphasis is on the pupil as a person, the teacher as a person, and the interaction that take place between them.*

2. *Individualization occurs when the teacher recognizes and responds to the emotional reactions of the learner as well as to his academic achievements, his intellectual mistakes, or his mental deficiencies.*

3. *Individualization goes beyond ordinary achievement. . . . the three R's become a means to the end of motivating the pupil to further learning, of exciting the pupil to further learning, of exciting the pupil about some aspect of his world to be further explored, of releasing in a learner confidence in his own competency, of triggering in another learner a burst of creative endeavor.*

4. *Individualization also occurs when the teacher considers the pupil to be an individual with unique perceptions, values, concepts, and needs, and when he creatively fashions learning opportunities to enhance the pupil's individuality.*

5. *Individualization is meant to lead to committment and purpose, to sensitivity to other's needs, to awareness of the demands of truth and justice.*

We hope that at the outset we have made it clear that it was not the purpose of the 1968 Nebraska Symposium to develop a formula or prescription for what individualized instruction should be. The resources for drawing upon the limitless latent potential of deaf learners has not been explored, and it is not a task to be accomplished in a two-day conference. The Midwest Regional Media Center for the Deaf was very fortunate in being able to assemble at this Conference a number of people who are outstanding in this particular field. They approached their task in a way that is remindful of the following quotation from George Bernard Shaw:

> *"I am not a teacher: only a fellow traveller of whom you asked the way. I pointed ahead--ahead of myself as well as of you."*

CHAPTER I

MEDIA SERVICES AND CAPTIONED FILMS REPORTS

by

Dr. Gilbert Delgado

Mr. Malcolm J. Norwood
Dr. Glenn S. Pfau
Dr. Raymond Wyman

Dr. William D. Jackson
Dr. Marshall S. Hester
Dr. Robert E. Stepp

Gilbert L. Delgado is presently the Acting Chief of Media Services and Captioned Films. Since 1964 until January of 1969 he has been serving as Assistant Chief of this branch of the Bureau of Education for the Handicapped.

Dr. Delgado received his B.A. from St. Michaels College in Santa Fe, New Mexico and in 1954 he received an M.S. in the Education of the Deaf from Gallaudet College. He has done post graduate work in several universities and received his Ph.D. in June of 1969 from Catholic University in Washington, D. C.

His professional career has been entirely in the field of education of the deaf. He began as a teacher in the New Mexico School for the Deaf in 1952. In 1954 he moved to California and taught at the Riverside School. Four years later he was transferred to the California School for the Deaf at Berkeley to assume the duties of Principal, a position he held until joining the Captioned Films staff in 1964.

Paper prepared for Symposium on Research and Utilization of Educational Media for Teaching the Deaf, March 17-19, 1969, Lincoln, Nebraska.

Sponsored by the Department of Educational Administration, Teachers College, University of Nebraska, and Media Services and Captioned Films, U.S. Office of Education, Department of Health, Education and Welfare, Washington, D. C.

Malcolm J. Norwood, Acquisitions Officer for Media Services and Captioned Films, Bureau of Education for the Handicapped, is a native of Hartford, Connecticut and a graduate of the American School for the Deaf. He obtained a B.A. from Gallaudet College in 1949 and a M.Ed. from the University of Hartford in 1957.

Mr. Norwood began his professional career as a teacher of the deaf in 1949. Since 1960 Mr. Norwood has been with Media Services and Captioned Films as an Education Officer and is responsible for acquisition and evaluation. In this role he has traveled extensively to organize and participate in various workshops and conferences. His varied experiences have helped him become one of the more knowledgable professionals in the area of education of the deaf.

Dr. Glenn S. Pfau is Director of Project LIFE (Language Improvement to Facilitate Education of hearing impaired children). He was an electronics technician and had five years of electronics experience before being granted a Bachelor's degree in Speech Pathology and Audiology from the University of Oregon. His Master's was in the area of Education of the Deaf from the Oregon College of Education and his Ph.D. was in Speech and Hearing Science from Ohio State University in 1967. He also holds a First Class Radio-Telephone license from the Federal Communications Commission.

Dr. Pfau worked for Project LIFE as a Research Assistant at the Ohio State University programming center for approximately two years. After completing his dissertation in the area of programmed instruction for the deaf, he joined the Project LIFE administrative staff at the National Education Association in Washington, D. C. as Assistant Director. He assumed the directorship of the Project in September of 1969 upon the retirement of Harley Z. Wooden.

Raymond Wyman, Ed. D., is Project Director of the Northeast Regional Media Center for the Deaf and Professor of Education and Director of the Audiovisual Center at the University of Massachusetts. A graduate of the University of Massachusetts, Dr. Wyman obtained his M.Ed. and doctorate at Boston University. Dr. Wyman has been with the University of Massachusetts since 1949. Previously, he was Audiovisual Supervisor for the Holyoke, Massachusetts, Public Schools and AV Supervisor and Science teacher at Westfield.

William D. Jackson is Director of the Southern Regional Media Center for the Deaf at Knoxville, Tennessee. He has a B.S. degree from Auburn and an M.A. and Ed.S. in AV Communications from Indiana University. He received his Ed.D. in June of 1967 from Indiana University. Dr. Jackson came to Knoxville from the Pilot School for the Deaf in Dallas, where he was first Director of Visual Aids and then Administrative Coordinator. Previously he had been Assistant to the Director of AV Services and Assistant Professor of Education at the State College of Calif. in Hayward.

Marshall S. Hester has been an educator in and administrator of schools for the deaf since 1927. He was Superintendent of the New Mexico School for the Deaf from 1944 until his retirement in 1964. Since September of 1964 Dr. Hester has been Director of the Southwest Regional Media Center for the Deaf (formerly the New Mexico Foundation). A graduate of Marion Institute, Marion Alabama, Dr. Hester received a B.S. degree from Millsaps College, Jackson Mississippi in 1931. He prepared for teaching in the field of the deaf at Gallaudet College where he got his M.A. in 1932. He has done graduate study at the University of California and received an Honorary Doctor of Letters from Gallaudet in 1960.

MEDIA SERVICES AND CAPTIONED FILMS REPORTS

Report on the Activities of Media Services and Captioned Films Branch

by Gilbert Delgado, Acting Chief

Welcome. May I take this opportunity to extend to all of you a very warm welcome from the Bureau of Education for the Handicapped and Media Services and Captioned Films.

For those of you who have not participated in one of Dr. Stepp's symposia, may I say you have a stimulating meeting to look forward to.

It seems that each year Dr. Stepp and his staff should wonder how they could hope to top that particular meeting the subsequent year. Still annually they manage to come up with a program that is as good as or better than the preceding year.

Report. I am happy that we have such a great "bench" as you can see from your program. You will get first hand information on specific programs supported by MSCF from Mr. Malcolm Norwood and other Project Directors.

Program growth began with initial funding of $78,000 in 1960 to the present allocation of $4.75 million.

Categories into which funds are divided and the approximate percentages are as follows: 34% Research-Demonstration and Training; 28% Acquisition; 16% Equipment; 11% Production; 6% salaries and Expenses; 5% Distribution.

Perhaps I should say a few words about two projects we are supporting, that may be of interest to you.

At New Mexico State University, Las Cruces, we are conducting a study of about 200 preschool learning impaired children to determine the level of visual perceptual development of these children. In this study the experimental group is receiving perceptual training through problem solving or free play therapy techniques. Thus far the data indicates:

1. Up to age three, hearing impaired children do not demonstrate significant perceptual difficulties.
2. From about age three to six, problems in normal development of these dkills begin to emerge. Some of the deficiencies noted were serious. Implications of these deficiencies can be correlated to reading problems.
3. In was demonstrated that problem solving and free play training were instrumental in increasing and maintaining perceptual skills close to or at the norm.
4. The study will now analyze the effect of training with one of the initial samples and its effect on "formal" reading instruction.

A project being developed under contract with the Thompson, Ramo, Woolridge Systems, Inc., (TRW Systems Inc.), in California seems to be very promising. It is a programmed learning, visually presented course in Basic Electronics Assembly for the deaf. The course will consist of seven parts and cover about seventy hours of instruction. It is now being validated at the state schools for the deaf in Riverside and Berkeley, California, and Salem, Oregon. Upon revision, it will provide a validated course that will enable a student to acquire basic electronics assembly skills, at a high level of proficiency, in one semester or less. The estimated cost of all hardware and instructional materials will be around $1,200.00 to $1,500.00.

I'd like to describe the priorities and direction of Media Services and Captioned Films in terms of the population it serves. In rank order, they would follow this sequence: school programs, (K-12); adult cultural and recreational program; teacher training; research, design and development; adult vocational education; parents, employers etc.; pre-school education.

The forces or components necessary to move these priorities in a concerted direction have actually been stages of development. Dr. Gough referred to them as the "gestation period." I have called it the metamorphosis of Media Services and Captioned Films. It has been our experience that before the real effectiveness of media can be realized, the consumer must be provided with ample materials and equipment. Shortly thereafter, or simultaneously, training in media utilization must be introduced. When this has happened, when there is fair diffusion, only then can inroads be made to focus on the role of media in a learning environment that is emphasizing the learner not the teacher. It is at this level that the teacher will begin to know the ingrediants for individualized instruction, for independent learning.

The program has always looked to the consumer (the teacher and the administrator) for direction and priorities. It has also shown leadership by generating innovation and attempting to bring educators of the deaf current information on applications of media and instructional technology.

As a consumer, the administrator has the responsibility to go beyond just having a media program or a media person. The administrator must have a hard look at new proven teaching strategies. He must be willing to commit, with conviction, to the instructional program that will do the very best job for each, individual child. This can mean a complete restructuring of curriculum and staff. It means rigorous and continual evaluation of objectives and outcomes. Are administrators willing to go the extra mile?

To the teacher this stage of development should mean a better understanding of what is being taught, from the perspective of each learner. Little has happened if the teacher approaches her task now by merely transferring what she did on the chalkboard to the overhead. All this has done is perhaps make her job a bit easier. When the teacher has learned to use media and the tools that are a part of this notion, to prescribe a modus operandi for each child, then and only then have we "arrived!"

The expanded authority to include all handicapped children has posed a rather difficult problem. The general direction this is taking is as follows:

1. On-going projects will receive media input from Media Services and Captioned Films.
2. The project, materials and level of media competency will be evaluated via computer within a larger demonstration project.
3. A Training, Design and Development Center will be established by "bid" at a university. This center will focus on training teachers in media materials on a limited basis.

The three activities will be closely meshed.

The above plan is tentative and subject to further study and revision.

As you know, the leadership in Media Services and Captioned Films program has changed with Dr. Gough's retirement. However, he left us a heritage which we respect. All of you, through your support, have helped us to help you get to this threshold. We know we can expect your continued support because--let's face it--we don't want to let handicapped children down.

The Second Decade

by Malcolm J. Norwood, Acquisition and Evaluation

In the beginning, there was nothing. Then on the first day...(See Figure 1) It was ten years ago this coming October that the U.S. Office of Education started out on a new venture, a captioned films program intended simply to provide a free loan service of films which would permit deaf persons to once again enjoy motion pictures. Had anyone dared to predict that this program would reach far beyond its original intent to play a major role in the education of the deaf, he would have been considered a prime candidate for a strait

1st DAY: "GOD CREATED THE HEAVENS AND THE EARTH."

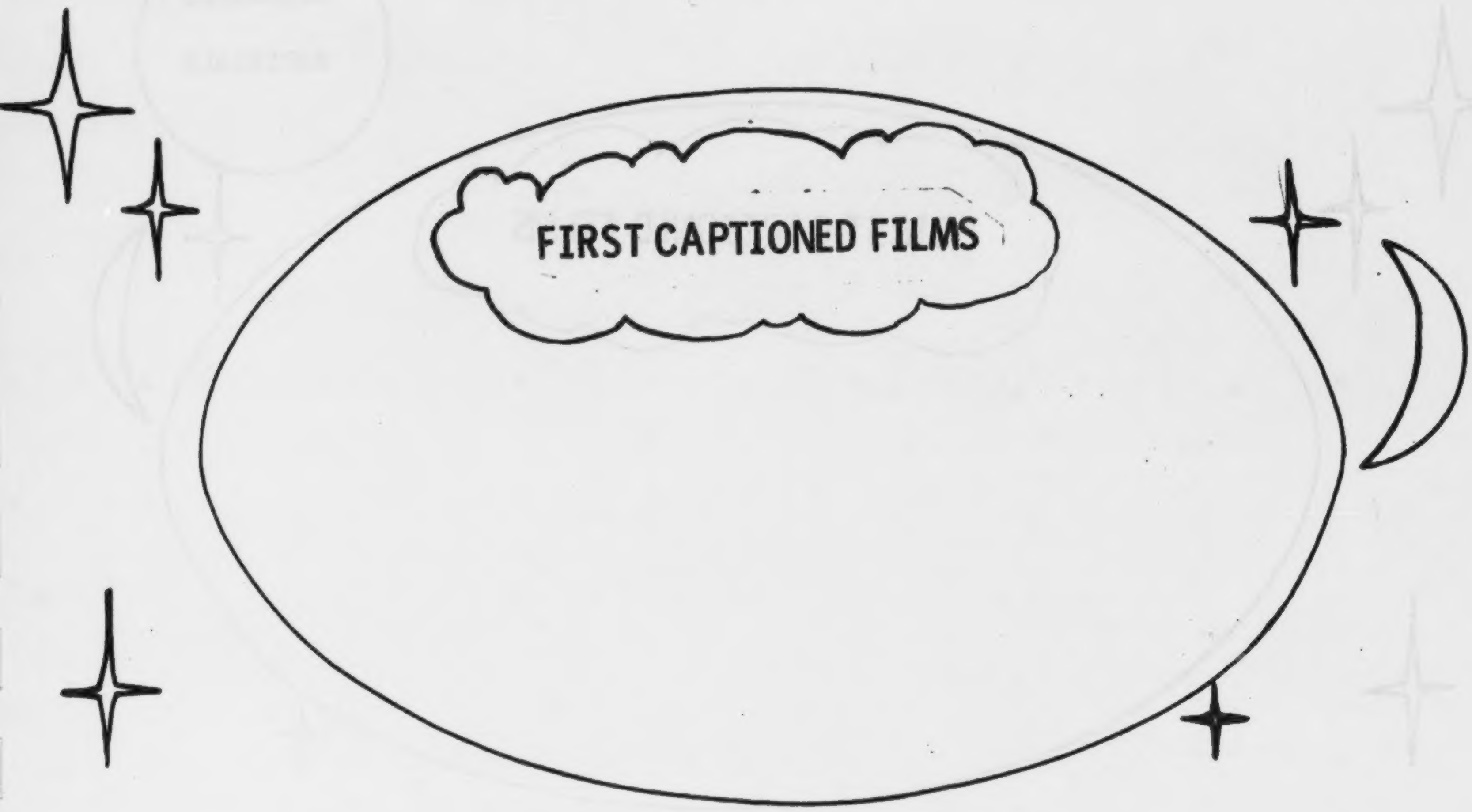

FIGURE 1.

jacket. But as it turned out, this is the role the program has played, due in no small measure to the foresightedness and consistent leadership of John A. Gough who quickly realized the great possibilities of instructional media as a means for helping the deaf child overcome the communication barrier that has long prevented him from realizing his potential.

And on the second day...(See Figure 2). As educators we need only take a backward glance to recall the classroom of ten, twenty or more years ago. Blackboards, chalk, books, pencils and so forth have been standard items more years that we can remember, the only innovation in a school for the deaf being the introduction of the group hearing aid. It does not require much to realize

2nd DAY: "LET THERE BE LIGHT."

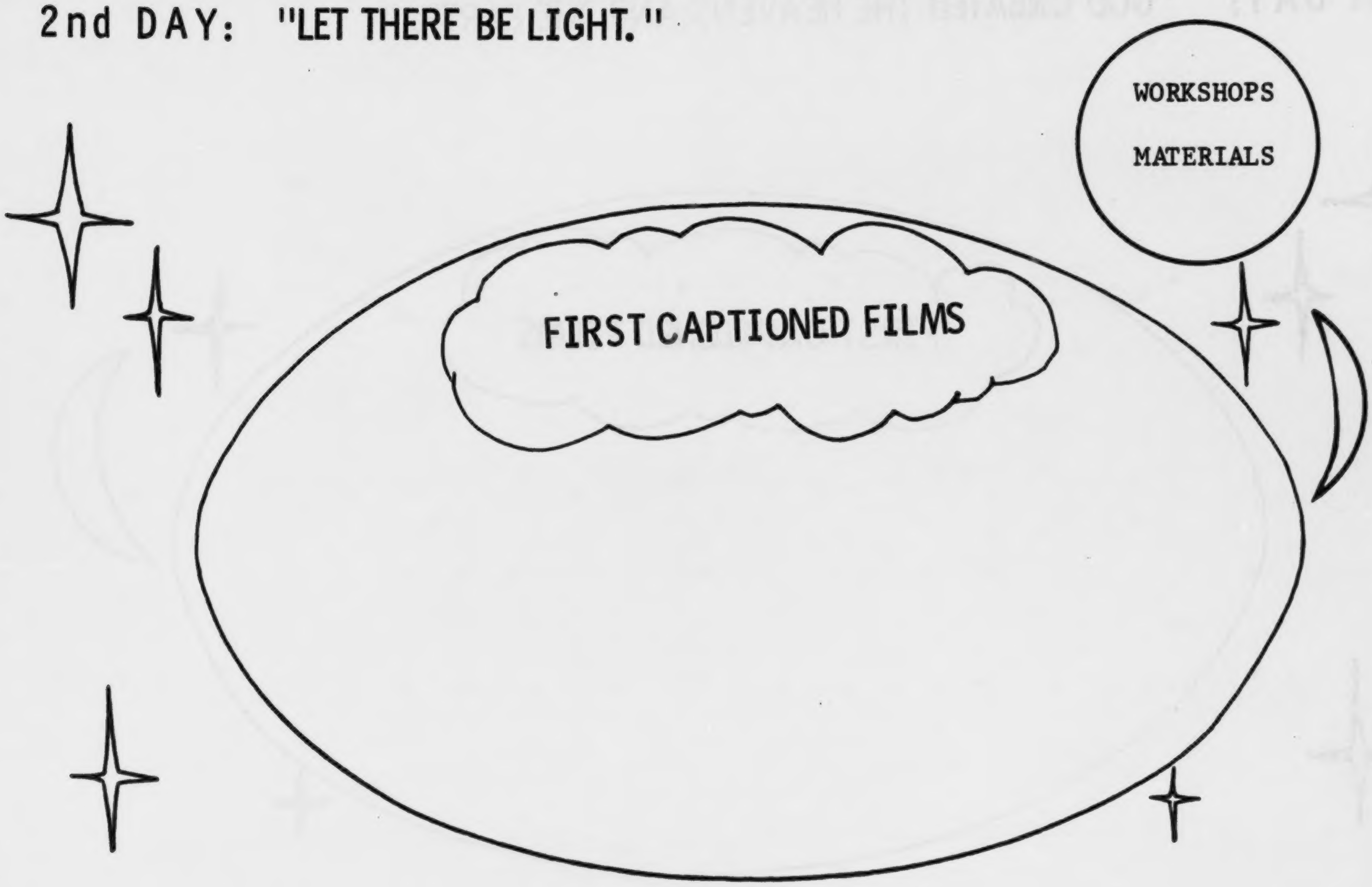

FIGURE 2.

the great changes that have occurred in the field, in fact, this realization begins to stagger the imagination when one really begins to think about it. The visual aid of a decade ago, usually a picture clipped from a magazine or a chart, has given way to films, transparencies, and filmstrips. Workshops to develop curriculum and evaluate suitable materials have done much to pave the way and have resulted in a quiet revolution which, consequently, is beginning to encourage teachers to break away from stiled classroom practices toward a multitude of educational experiences never tried before.

And on the third day...(See Figure 3). Back in 1962 we can recall that out of approximately 300 schools for the deaf registered with the program, only one had a media person and this person was working half-time.

3rd DAY: "LET THE WATERS AND FIRMAMENT DIVIDE. LET THERE BE AIR."

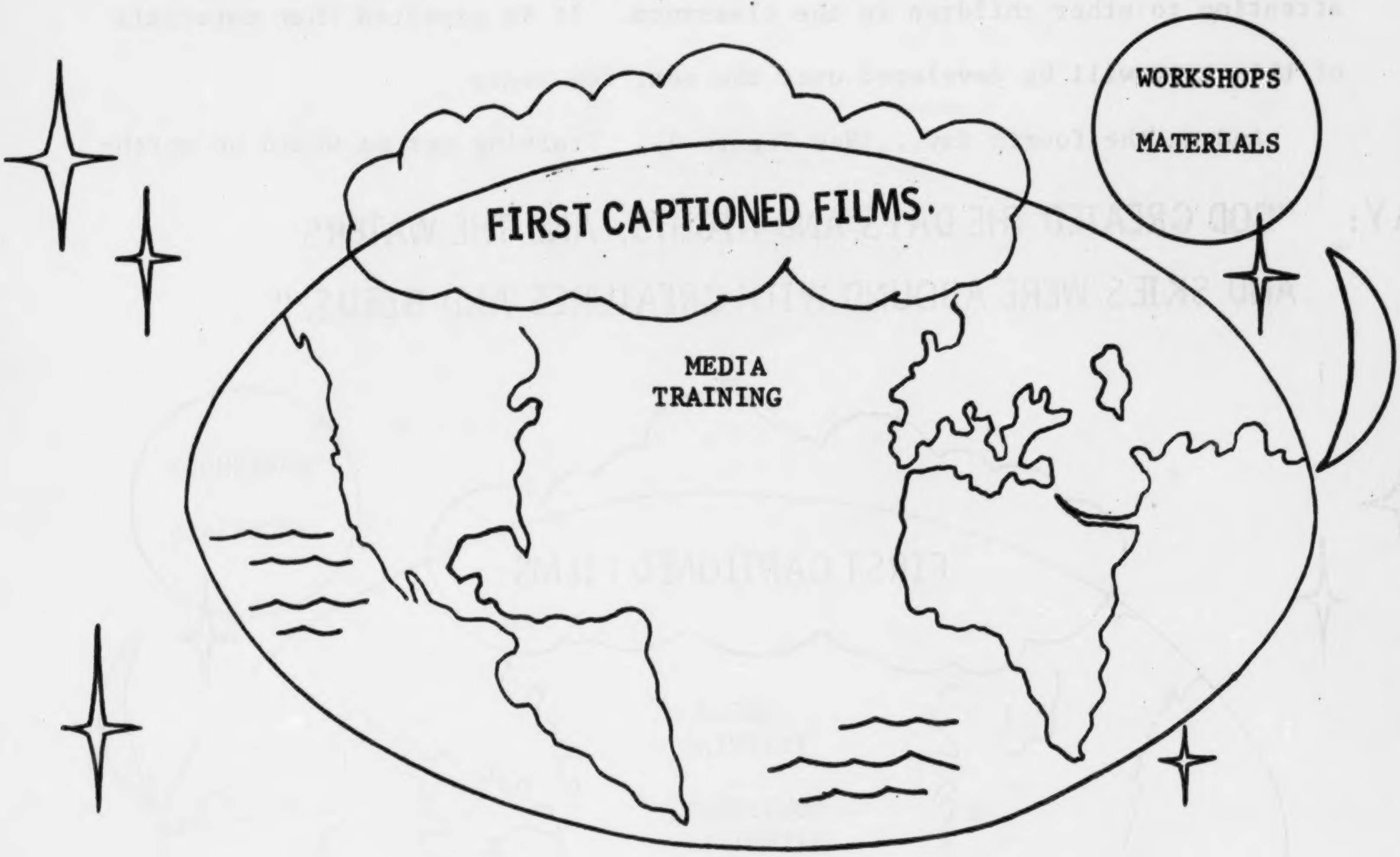

FIGURE 3.

Consequently, the impact of media training has been such, that nearly all of the 700 plus schools now registered have either a full time media specialist, a media specialist working half-time or at least one person on the staff who has some knowledge of media and its applications.

Yet much remains to be done. There is a great need for retraining teacher trainers and teachers and convincing administrators of this need so that the way will be paved for a more effective school staff fully prepared and flexible enough to create a more receptive learning environment. Such training will permit a teacher to have the time to develop or modify materials to help a single child grasp a concept. It would be possible, for example, to have a series of 8mm films to teach handwriting, manuscript or cursive, left hand or right hand to one or more children while the teacher is giving individual attention to other children in the classroom. It is expected that materials of this type will be developed over the next few years.

And on the fourth day...(See Figure 4). Training per se would be worthless without the tools. Consequently, almost every classroom for the deaf has been provided with equipment to help the teacher do the job. We know that for certain purposes, a textbook is better than a teacher or we wouldn't use it. No teacher can answer every child's question, thus textbooks, dictionaries and encyclopedias, properly used, are able to pinch-hit for the teacher in a variety of situations. Modern life is so varied and complex

4th DAY: "GOD CREATED THE DAYS AND NIGHTS, AND THE WATERS AND SKIES WERE ABOUND WITH CREATURES AND BIRDS."

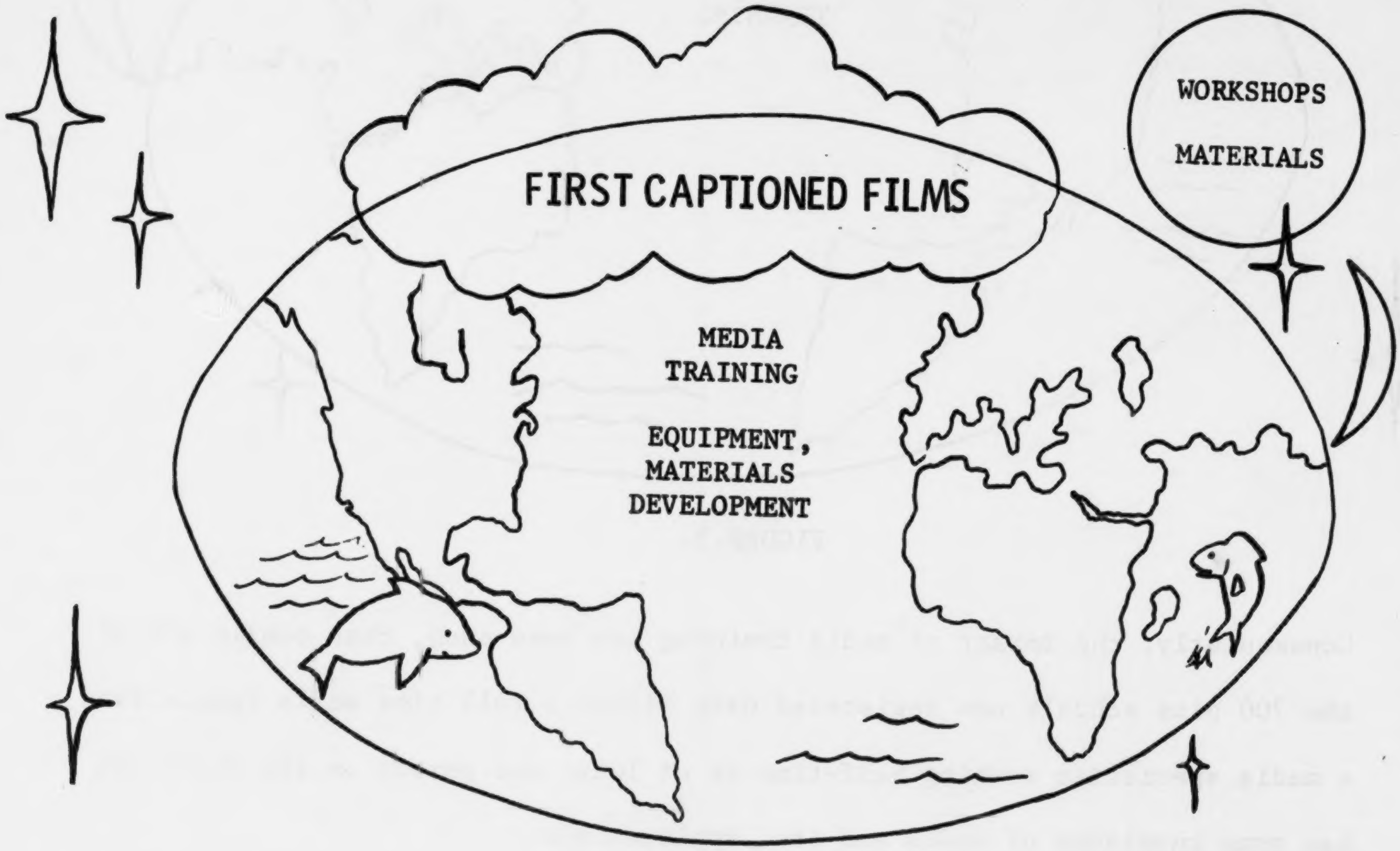
FIRST CAPTIONED FILMS
MEDIA
TRAINING
EQUIPMENT,
MATERIALS
DEVELOPMENT
WORKSHOPS
MATERIALS

FIGURE 4.

it is impossible to teach everything and we need to do all we can to concentrate on those educational tools which will most likely help the deaf child keep pace with a way of life that is constantly changing.

And on the fifth day...(See Figure 5). Education as a whole is changing and we are moving away from the single teacher toward the instructional team. The use of para-professionals and technicians who are trained in the educational process to work with a master teacher is fast becoming a reality. As a result of this approach, the deaf child will receive more individual attention, but at the same time he will need to assume a greater responsibility for his own education. No longer will the focus be on the storing and retrieving

5th DAY: "LET THE EARTH BRING FORTH ALL KINDS OF LIVING CREATURES."

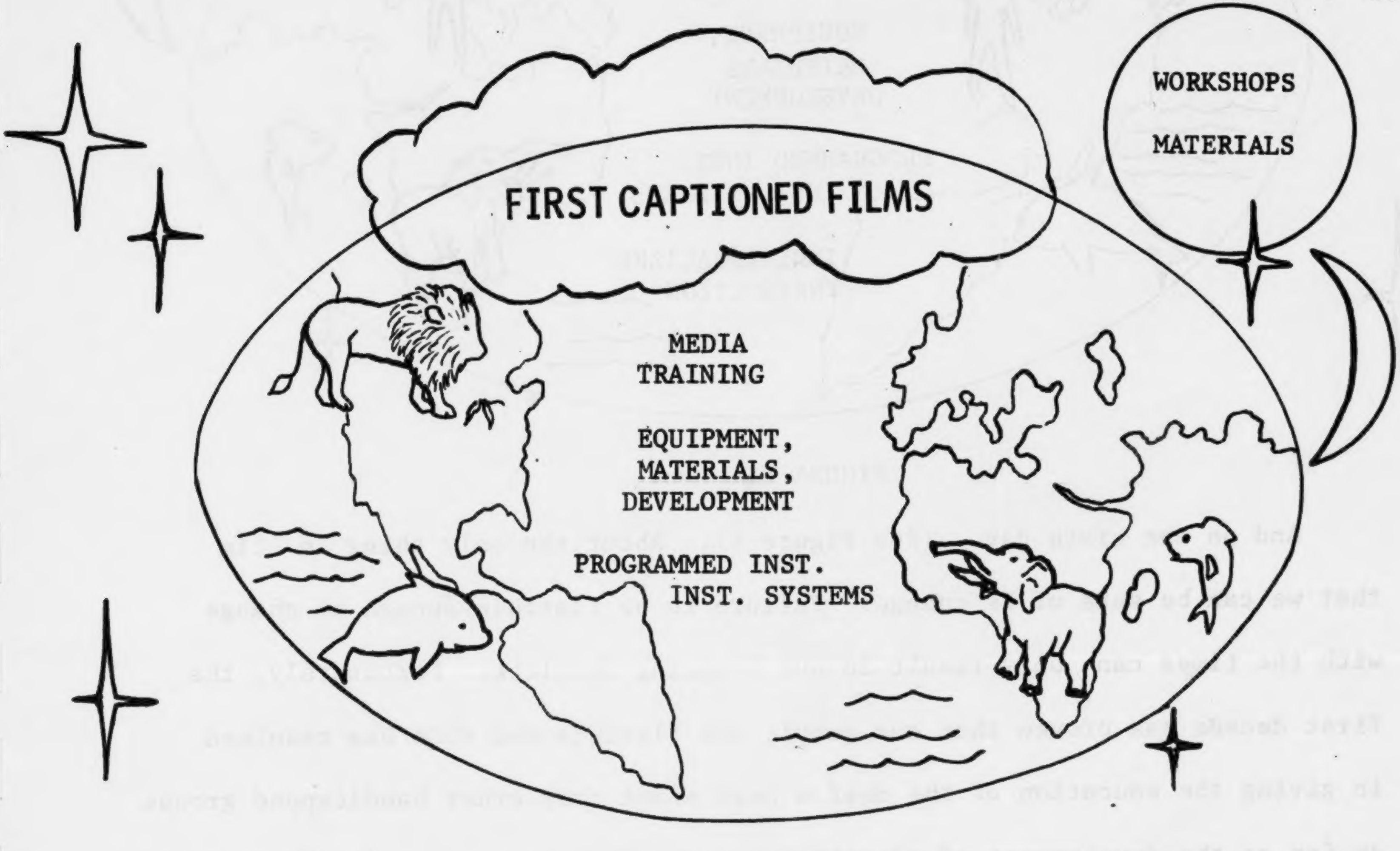
WORKSHOPS
MATERIALS
FIRST CAPTIONED FILMS
MEDIA
TRAINING
EQUIPMENT,
MATERIALS,
DEVELOPMENT
PROGRAMMED INST.
INST. SYSTEMS

FIGURE 5.

of facts, but rather on the creation of situations which will permit actual or practical use of information. Instead of being a frustrating experience, learning will become more enjoyable. These changes will be greatly helped by individualized instruction, a vitally needed tool with high potential.

6th Day: "Let us make mankind in our image and likeness."

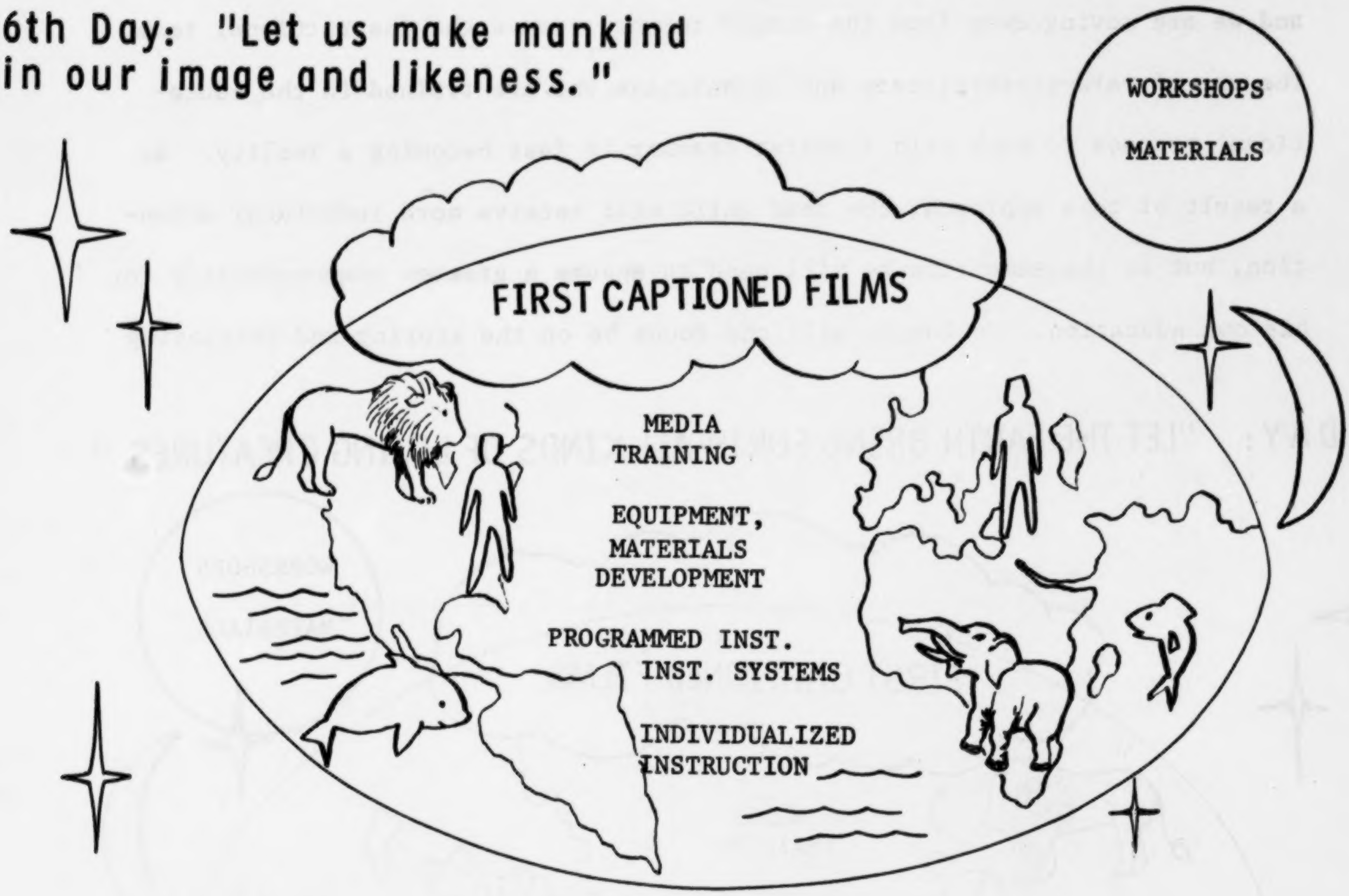
WORKSHOPS
MATERIALS
FIRST CAPTIONED FILMS
MEDIA TRAINING
EQUIPMENT, MATERIALS DEVELOPMENT
PROGRAMMED INST.
INST. SYSTEMS
INDIVIDUALIZED INSTRUCTION

FIGURE 6.

And on the sixth day...(See Figure 6). About the only thing in life that we can be sure of is change. Failure to be flexible enough to change with the times can only result in our becoming obsolete. Fortunately, the first decade has proven that our people are flexible and this has resulted in giving the education of the deaf a head start over other handicapped groups as far as the development of educational technology is concerned. The retirement of Dr. Gough has naturally resulted in a change in program leadership, but not in the basic philosophy that the deaf child must be given every opportunity to function and that the learning environment must be arranged to permit him to become a more independent learner. The time has come to shift gears.

And on the seventh day...(See Figure 7). During the second decade we need to remember that changes are going to occur rapidly and that we must always be flexible in our thinking. Careful and often difficult decisions will need to be made for it will be our responsibility to make certain judgements regarding directons to take. We are now entering an era of design and development from which we can expect much progress from educational engineering, that is, a systematic approach to setting up a learning environment which

7th DAY: "HE RESTED ON THE SEVENTH DAY."

CAN WE AFFORD TO?

FIGURE 7.

will permit deaf children to acquire the skills they need. Hardware and software developed under this approach will be carefully field tested not only to be sure these are the materials our children need, but also to insure strict quality control. This is very important for we can not afford to jump at each new promising design, for tommorow it could very well become obsolete. Alexander Pope, the great English poet, once said, "Be not the first by whom the new are tried, Nor yet the last to lay the old aside." Good advice which still holds true, but as we approach the end of the pioneering era and enter the era of settlement, there still will be times when it will be necessary to be the first to try the new. We did during the first ten years and with your continued help we are prepared, whenever necessary, to do it again during the second decade.

Project LIFE PI Analysis

by Glenn S. Pfau, Assistant Director, Project LIFE [1]

Project LIFE (Language Improvement to Facilitate Education of hearing impaired children) is sponsored by Media Services and Captioned Films, U.S. Office of Education, and is administered by the National Education Association, Washington, D. C. The planning phases of the Project were first funded in 1963, at which time the Project had one part-time employee. Presently, there are 18 full-time staff members, including specialists in language, programming, art and production. For information concerning the scope and various aspects of the Project, the reader is referred to earlier publications (Wooden and Willard, 1965; Wooden, 1966, Pfau, 1968).

After a comprehensive survey of the profession of deaf education in 1963, it was concluded that a project should be initiated to develop supplementary language instructional facilities and methods. It was decided that these should attempt to: (1) increase significantly the language learning rate of primary- and intermediate-aged prelingually deaf children, and (2) upgrade the language skills of the postlingually deaf and severely hard of hearing. Since expressive language is contingent upon a well developed and functional receptive language system, it was reasoned that the latter should first be the Project's primary concern. Thus, the teaching of receptive language accomplishes two major objectives. The first is to enable the child to better understand his environment and relationship with others. The second is to build the foundation for expressive language through which he will be better able to exercise some degree of control over the environment and his interpersonal relationships.

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[1] This paper was prepared with assistance from other Project LIFE staff members: namely, Mr. Harley Z. Wooden, Director; Mr. Charles E. Zerrip, Coordinator of Programmed Instruction and Production; and Mrs. Hilda C. Williams, Coordinator of Language.

Based upon five years of experimentation with deaf children, the Project has concluded that instruction for the developement of true expressive language can be much more effectively accomplished by any average teacher of the deaf than it can by machine. True expressive language is created in the child's own mind and expressed by him in his own words. If we can guarantee the exact wording of a correct response in a subject that possesses the scope and the many facetted features of English, to what extent can that response be considered expressive language? Similarly, if we seek and obtain real expressive language, how can the programmer guess all the possible phrasings of a correct response? And if the programmer cannot guess all the possible phrasings, how can a deaf child with his limited language skills be sure that his response, even though correct, is essentially the same as or unlike the various options that the programmer supplies on the confirmation frame? Possibly, with increased technology and computerization, new advances will be made which will allow precise feedback to the student regarding the correctness of any expressive response he desires to make. Despite the present limitations, the Project is continuing to experiment with various types of materials to develop and enhance the deaf child's expressive language.

As implied, the heart of the Project is programmed instruction. Though a limited number of programmed auditory tapes and movies have been developed, the bulk of the efforts have been devoted to programmed filmstrips. These are supplemented by specially illustrated children's story booklets, concept oriented picture dictionaries, and workbooks. For a description of the supplementary materials the reader is again referred to earlier articles which cover the scope of the Project. The programming procedure, special considerations and evaluative techniques will be the topics of the following paragraphs.

Programming Restraints. Nearly every type of mediated instruction has restraints. Some of course have more restrictions or limitations than others. In general, the efficiency of any system is directly proportional to the number and types of restraints imposed upon it. The Project programmers are directly concerned with three major types of restraints: (1) the abilities and characteristics of the target population (those for whom the program is intended); (2) the hardware (the teaching machine's capabilities); and (3) the software (the limitations imposed by the program itself). (See Figure No.8)

The Project programmers indicate that the greatest curb is imposed on them by the learner, rather than any aspect of the presentation mode or program. Of critical importance is the severity and type of hearing loss and the age of the child when the given loss occurred. If the loss is profound and prelingual, it will have a marked effect upon the number and type of

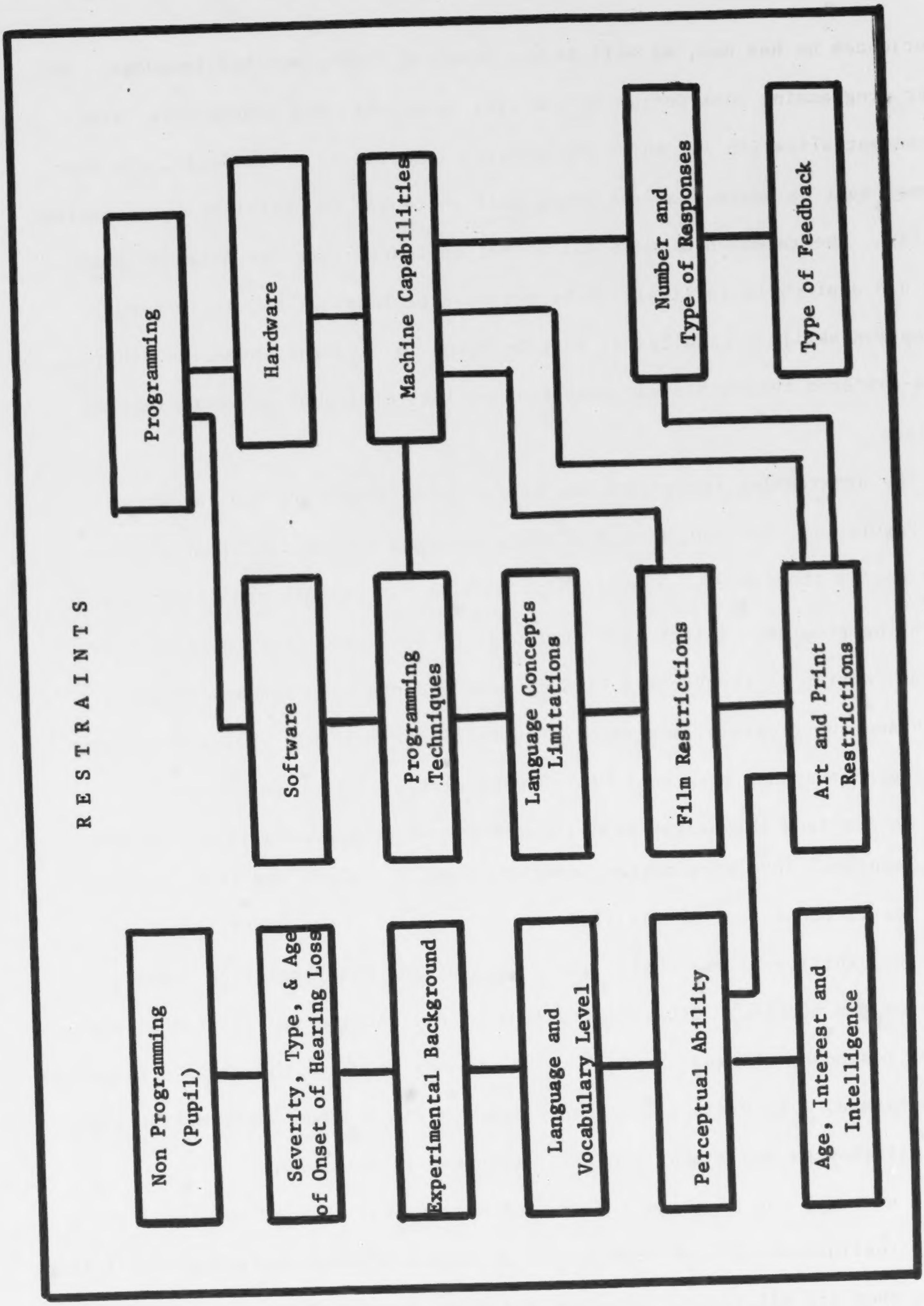

RESTRAINTS
Programming
Hardware
Machine Capabilities
Number and Type of Responses
Type of Feedback
Software
Programming Techniques
Language Concepts Limitations
Film Restrictions
Art and Print Restrictions
Non Programming (Pupil)
Severity, Type, & Age of Onset of Hearing Loss
Experimental Background
Language and Vocabulary Level
Perceptual Ability
Age, Interest and Intelligence

FIGURE 8

experiences he has had, as well as his level of vocabulary and language. Another programming restriction is the age, interests, and approximate level of conceptualization for which the program is intended. Similarly, the programmer must be aware that the young deaf child may be deficient in perceptual ability. The research of Marshall (1968) indicates that the seven to eight year old deaf child is likely to be retarded at least 21 months in visual perception skills. Finally, it must be borne in mind that numerous other child-centered restraints can stem from social, emotional or communication problems.

The programming restraints are of two types--software and hardware. (See Figure 8.) The two, though closely related, impose different demarcations upon a programmer. The teaching machine has certain capabilities which govern the programming technique that will be employed. For instance, the present version of the Project LIFE machine accepts only linear, rather than branching programs, and is more suitable for multiple choice than for constructed response programs. A software restraint is that certain concepts do not lend themselves well to traditional programming (i.e., sensations, concepts involving motion, emotions, etc.). Also, the film, art and print restrictions must be realized in terms of all three restraints--the perceptual ability of the child, the software, and the resolution characteristics of the machine. Other limitations of the machine are the number and type of responses allowed, as well as the manner in which the child's responses are confirmed. The Project confirms responses via a green confirmation light which illuminates the moment a correct response is obtained.

In summary, the programmer must continually bear in mind the total spectrum of restraints. Though some appear to have a greater confining effect than others, they are all tightly entwined and often have an influence upon one another.

Language Considerations. Possibly,the most important decision that has to be made is the selection of the vocabulary, language principles, and sentence structures that should be used and the order in which they should be presented. The Project's early programs begin with language that the child will need in order to make his wants known. As the child's immediate environment grows, his need for additional vocabulary increases. Correspondingly, the sentence patterns must increase in complexity to include direct objects, modifiers, etc., in direct proportion to the child's needs. Thus, all aspects of language are developed in a hierarchical manner leading from the simple to the complex, not unlike the steps of learning suggested by Gagne (1964).

The project programmers have found that a considerable amount of later revision and modification can be reduced if they first ask themselves a series of questions. Some of these questions are listed below:

1. Am I providing enough meaningful repetitions to enable the child to store up this information for later use?
2. Am I providing opportunities in a variety of ways for the child to relate the new material to what he has already learned, thus ever expanding his concepts?
3. Am I giving him an opportunity to apply information he has learned to new situations?
4. Does the material relate to his immediate needs, interests, and activities, thus furnishing him with language he can use to meet his needs?
5. Am I varying the format so as to make the program interesting as well as challenging?
6. Am I choosing pictures that accurately convey the concept that I am presenting?

7. Does the reading material give practice in phrase and sentence reading?
8. Is the material designed so that it requires the child to carefully read every word in order to make the correct response?
9. Have I kept guessing to a minimum?
10. Have I provided the necessary learning activities to develop in the child the ability to extract the meaning of words from context?
11. Will my program develop the child's ability to generalize or categorize?
12. Have I provided the child with opportunities to do sequential thinking?
13. Have I provided material that will enable the child to predict the outcome, as well as evaluate given events?

As previously stated, the programming goals for the very young deaf child should focus on the establishment of a functional receptive language system. Thus, the curricular objective initially centers on the student himself. It is the long range plan for which the instructional objectives may later be determined by societal and subject matter demands. A comprehensive discussion of these three instructional goals is given by Tyler (1950). Another excellent source for assisting the programmer in the planning and development of meaningful educational objectives is Bloom (1956). Regardless of the programmer's precise objectives, all programs should attempt to develop the pupil's thinking skills. Of course, proficiency at any particular thinking skill is not dichotomous in nature but is on a continuum from a low level to a high level of abstraction. The programmers' task becomes one of identifying the present level at which the child is functioning and then outlining the necessary instructional strategies to further develop that skill. The Project has identified some of the more important thinking skills as follows:

1. Making associations
2. Making comparisons and contrasts
3. Making analogies
4. Arranging in logical sequence
5. The ability to classify and make generalizations
6. Detecting absurdities
7. Matching
8. Making discriminations
9. Grouping
10. Making inferences
11. Drawing conclusions
12. Extricating the meaning of a new word from context
13. Reasoning
14. Making a judgment
15. Predicting the outcome of a given event
16. Meaningful completion of pictures or situations

Educators of the deaf have long recognized that the hub of the deaf child's language problems are in the structural meanings, or those meanings carried by the system itself. Newsome (1962) states that structural meanings are carried by five signals: inflections, derivational suffixes, function words, word order, and stress or prosody. The structural meanings can be contrasted with lexical meanings, or those which are carried by the form words: nouns, verbs, pronouns, adjectives, and adverbs. An example of the importance of the former can be readily shown. Of the 450,000 words in the English language, only about 150 are function words (the balance are lexical). Yet these few words comprise about one third of our output of daily language (Fries, 1940). The task of teaching the correct usage of these words to deaf children is awesome since many of them have 40-50 different meanings. Fries (1962) found, for example, that Thorndike's (1944) 500 most frequently used words conveyed a total of 14,070 different meanings, or an average of about 28 meanings per word.

The Project views structural meanings as one of its greatest challenges (Wooden, 1966). Programming the structural aspects of language is extremely difficult for at least two reasons: (1) the structural words or signals are non-picturable, and (2) they possess little or no meaning in themselves. However, as Wooden states, "Each of them varies the function of the lexical work with which it appears. Therefore, they provide situations that quite frequently can be illustrated either pictorially or graphically."

Program Considerations. After a comprehensive analysis has been made of the English language, a study of the deaf child's language problems must be made. This gives the programmer a basis for establishing the necessary initial vocabulary, language principles, and sentence patterns. These must be programmed and they in turn serve as the foundation for subsequent programs. Every program should be designed to teach what it sets out to do in the most effective, economical, and interesting matter possible. This writer has designed a programming flow chart which schematically shows the procedure used by Project LIFE in planning, constructing, and evaluating a program of instruction. (See Figure 9)

The Project's programs are developed around thematic units (composed of approximately 600 frames each). Some of the early ones are: people, pets, toys, body parts, clothing, foods, shelter, safety, holidays, sports, community helpers, and the like. Each unit is divided into sections with specific objectives. The reader is referred to a book by Mager, Preparing Objectives for Programmed Instruction (1962), for an analysis of the steps employed by the Project programmers in composing objectives. These must be stated in behavioral terms, as indicated by Popham (1965):

> Meaningful instructional objectives, therefore, must be stated in terms of student behavior, they must specify the type of behavior a student will engage (or be able to engage) when he has satisfactorily achieved the objective..."Behavior" in this sense is defined rather broadly. It does not need to be behavior only on a test but perhaps behavior in an informal situation specifically contrived by the instructor to reflect a more basic kind of commitment.

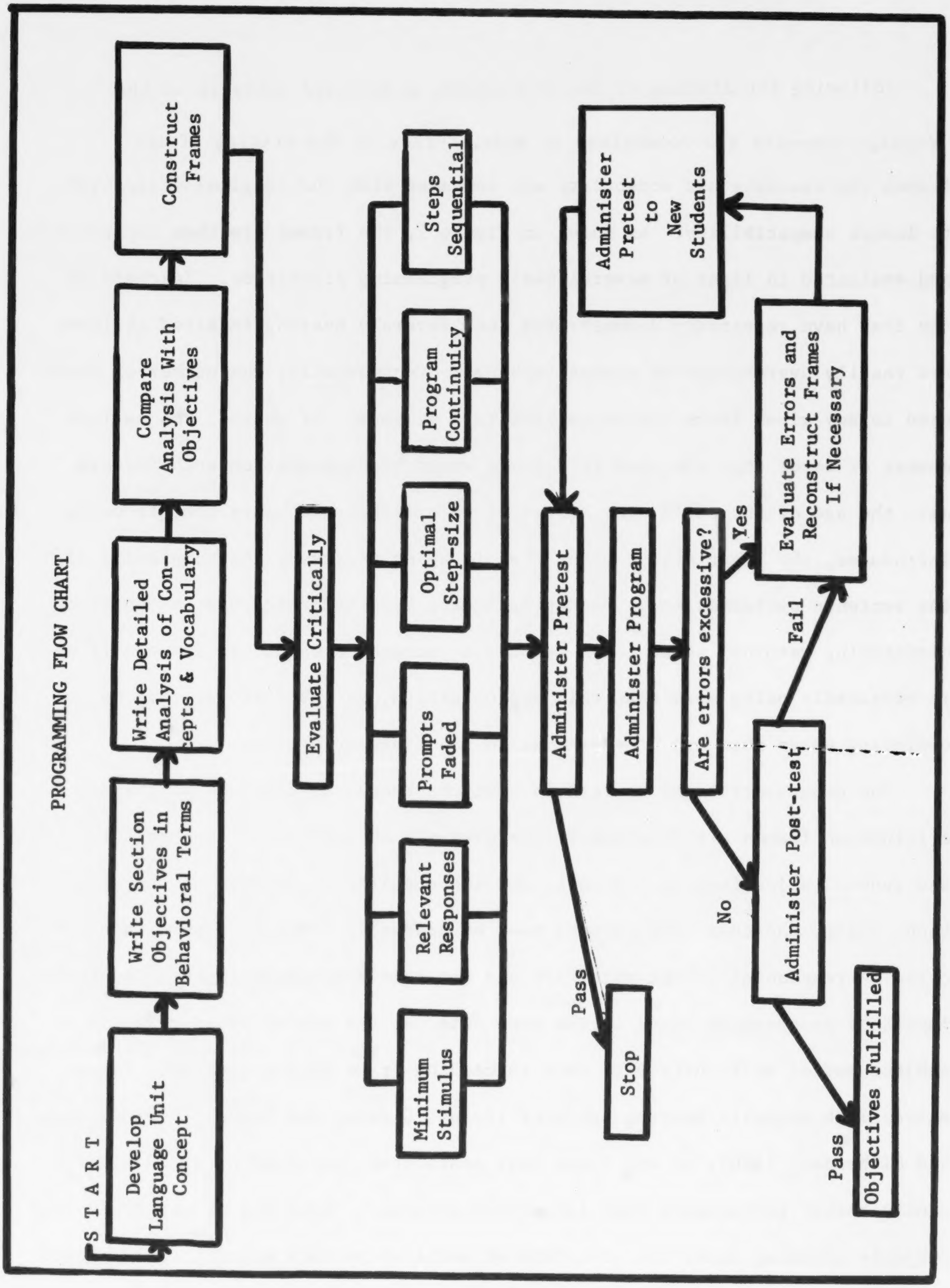

PROGRAMMING FLOW CHART
START
Develop Language Unit Concept
Write Section Objectives in Behavioral Terms
Write Detailed Analysis of Concepts & Vocabulary
Compare Analysis With Objectives
Construct Frames
Evaluate Critically
Minimum Stimulus
Relevant Responses
Prompts Faded
Optimal Step-size
Program Continuity
Steps Sequential
Administer Pretest
Pass
Stop
Administer Program
Are errors excessive?
No
Yes
Administer Post-test
Pass
Objectives Fulfilled
Fail
Evaluate Errors and Reconstruct Frames If Necessary
Administer Pretest to New Students

FIGURE 9

Following the listing of the objectives, a detailed analysis of the language concepts and vocabulary is made. Prior to the writing of the frames the concepts and vocabulary are compared with the original objectives to insure compatibility. As shown on Figure 9, the frames are then constructed and evaluated in light of several basic programming principles. Teachers of the deaf have repeatedly demonstrated that severely hearing impaired children are readily overwhelmed by excess verbiage. Consequently, the number of words used in any given frame should be kept to a minimum. Of course, the maximum number of words that are used in a frame would be dependent on such factors as: the age of the child, the amount of unfamiliar vocabulary that is being introduced, the linguistic concept that is being stressed, the complexity of the sentence patterns, etc. Some programmers have indicated that a "point of diminishing returns" seems to be reached at around 20 words per frame. If he is repeatedly using more than this approximation, he may discover that he is employing words that are nonessential to the frame objectives.

The programmers must be certain that the responses demanded on the discrimination frames are relevant to the over-all objectives of the Project, the general objectives of the unit, and the specific objectives of the section. Also, the cues and prompts must be gradually faded to insure that the child is responding to the objective and not some extraneous factor. Another important programming check is the step size, or the amount of increase in subject matter difficulty with each succeeding frame in the program. In research with normally hearing subjects (Evans, Glaser, and Homme, 1959; Coulson and Silberman, 1960), it was found that small step programs produced significantly better performance than large step programs. However, it was found that subjects learning under the procedure of small steps took significantly longer to complete a given program. The Project has attempted to compromise between the two extremes. Thus, an attempt is being made at developing programs that possess a step size that challenges the deaf child but not so large that he becomes discouraged with the complexity of the task. Closely related to the size of the steps is the step sequence. The presentation should be logical and sequential and the chain of thought from frame to frame should be carefully linked.

The Figure 9 flow chart shows that the remaining steps in the analysis of the program are traditional in nature. The pretest is administered to a series of students. Those who pass do not need that program but instead will take the pretest of the next program in sequence. This procedure is continued until a pretest is failed. They are then administered that particular program. If their program errors are excessive, the errors are evaluated and the program frames are reconstructed if necessary. If the frames are rewritten, the program must be retested on a new group of deaf students (the selection of the new students is contingent upon the failing of the pretest). If the pupil's program errors are not excessive, they are administered the post-test. Of course, if they pass the post-test, the objectives are fulfilled. If they fail the post-test, the programmer may conclude that the program of instruction did not teach what it was supposed to teach. The logical procedure would then be to again reconstruct the program frames and again administer the program to a new group of students. In other words, the post-test is the juncture at which the programmer determines whether the student can actually behave as planned when the specific objectives for the section were formulated.

Summary. This paper has attempted to analyze some of the factors that must be considered when developing programs of instruction for the deaf student. As indicated, the most basic consideration is the identification of the target population. The programmer must also reach a dicision regarding the programming technique and presentation-response mode that he will employ. He must then attempt to appraise the restraints intrinsic from the standpoint of the child and then those related to the hardware or software. Finally, programs are developed in light of the special language and programming considerations.

Progress Report on the Visual Response System

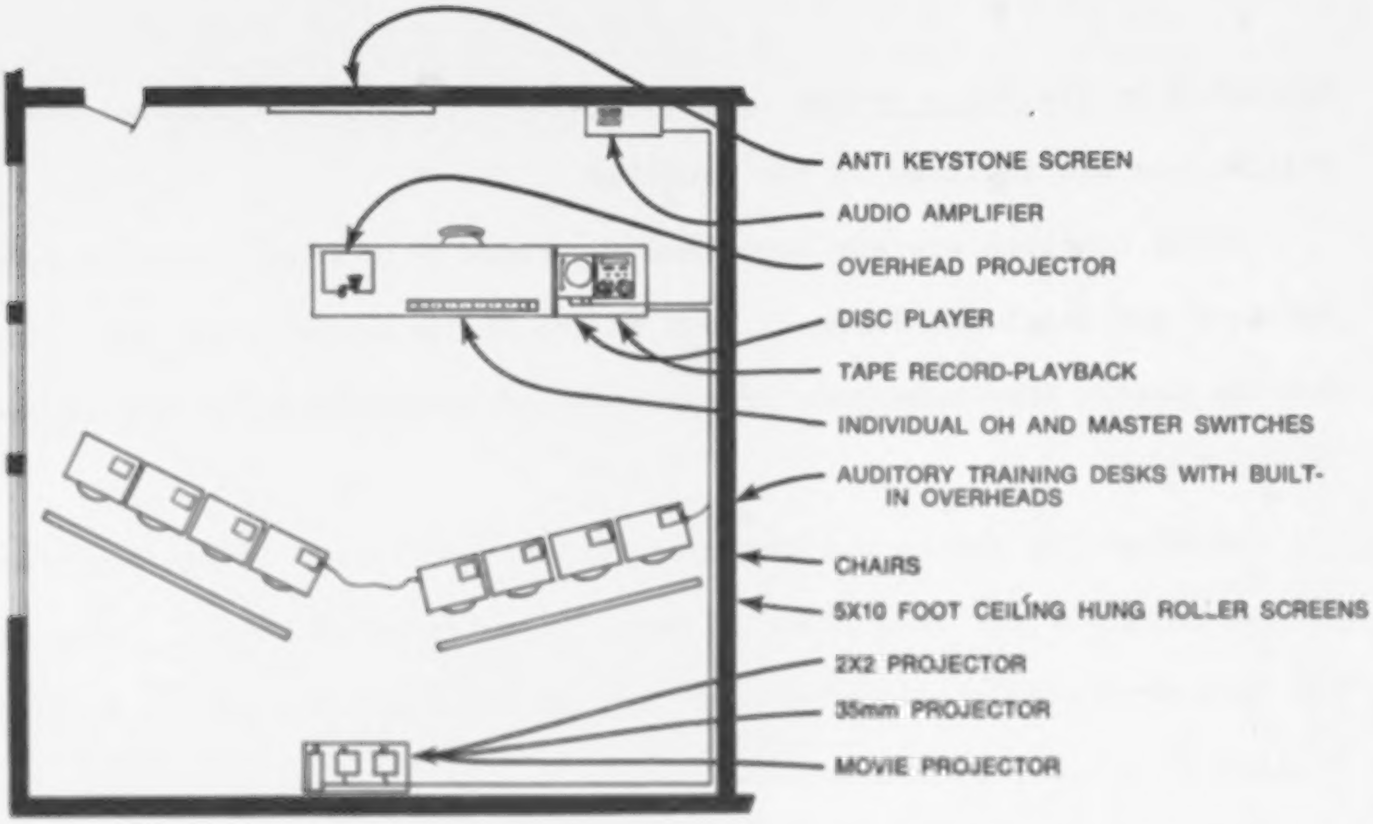
by Raymond Wyman, Director, NE Media Center for the Deaf

The Visiual Response System was invented about eighteen months ago in order to provide a class of eight deaf children with the ability to communicate individual responses to their teacher by means of individual overhead projectors grouped in a V format. Preliminary experimentation with ordinary overhead projectors was encouraging enough to prompt a report at the 1969 Symposium. Experienced educators of the deaf saw enough merit in the unique system to encourage the author to proceed with additional experiments.

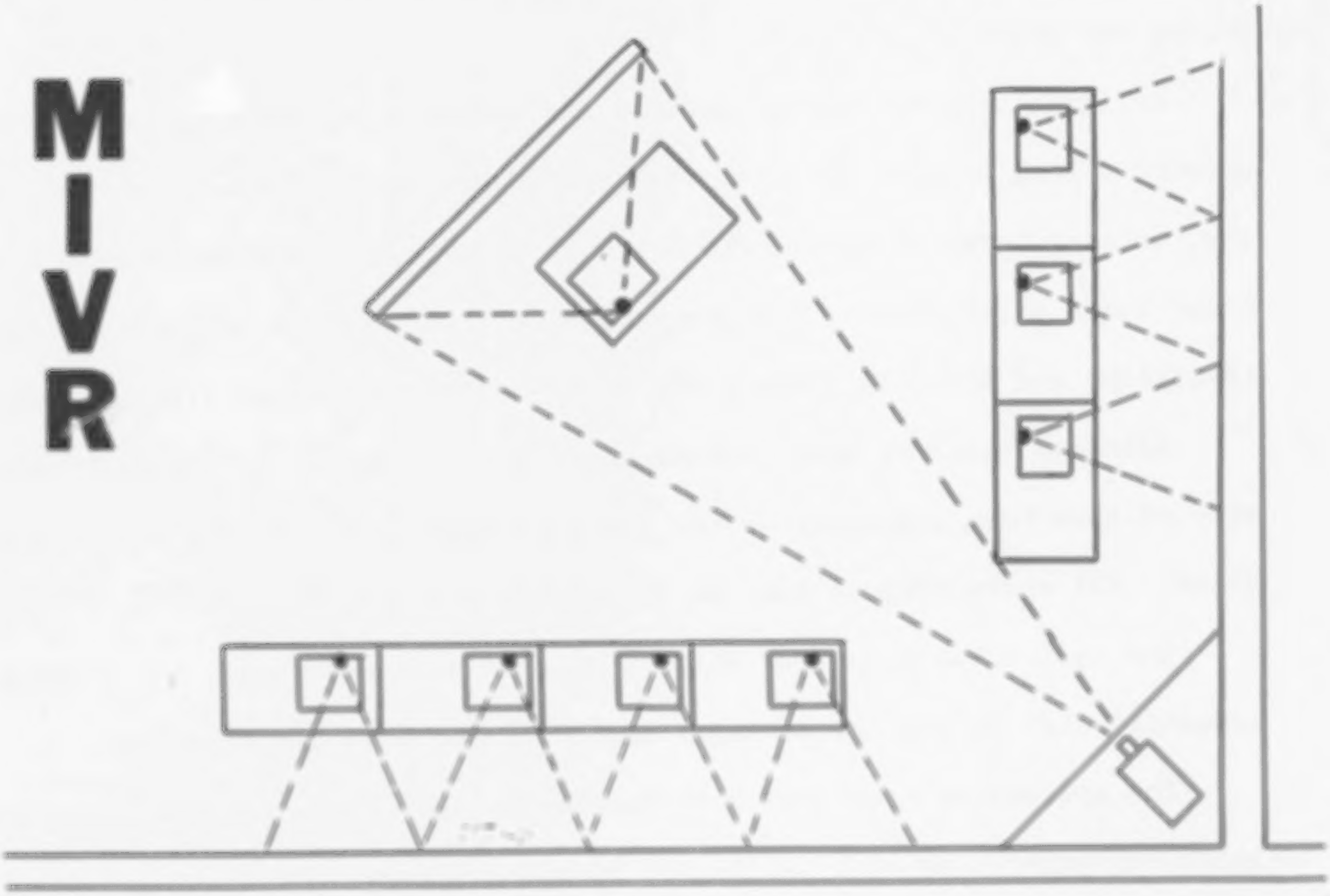
During the ensuing year, constant experimentation has been conducted at the American School for the Deaf in West Hartford, and for brief periods at Clarke, Austine, Crotched Mountain, Governor Baxter and Sterck Schools.

A special overhead projector model designated 80 MIVR has been developed by the Buhl Projector Company with help from the General Electric Lamp Department and the author. It has a 150 watt low voltage lamp that provides adequate lumens for the images that are only about three feet across. The fan is operated by a thermostat only after it becomes hot, which is infrequent in usual use. The eight student machines require only 1200 watts or ten amperes and they ordinarily make no noise. (See Figure 10)

Two journal articles describing the system and its use have been prepared and published. "A Visual Response System for Small-Group Interaction" was published by Audiovisual Instruction in September, 1968, and "A Visual Response System for Teacher-Group Interaction in the Education of Deaf Children" was


ANTI KEYSTONE SCREEN
AUDIO AMPLIFIER
OVERHEAD PROJECTOR
DISC PLAYER
TAPE RECORD-PLAYBACK
INDIVIDUAL OH AND MASTER SWITCHES
AUDITORY TRAINING DESKS WITH BUILT-IN OVERHEADS
CHAIRS
5X10 FOOT CEILING HUNG ROLLER SCREENS
2X2 PROJECTOR
35mm PROJECTOR
MOVIE PROJECTOR

MIVR system set up in a small classroom or seminar room.



It could also be set up in a corner of a large classroom with the two walls used as screens.

FIGURE 10

published by The Volta Review in March, 1969. Diagrams of typical room installations are included in the articles.

Three complete systems have been purchased with funds provided by Media Services and Captioned Films of USOE to the Northeast Regional Media Center for the Deaf. They have been transported and demonstrated by the author and Joseph Panko.

Although the system was designed for deaf children, it has also been used with seeming success in a class of mentally retarded children. A new system has been promised on a loan basis by the manufacturer for tryout in ghetto, bi-lingual and normal classrooms.

There seems to be a feeling on the part of those who have taught with it or seen it demonstrated, that several very important contributions can be made to the education of the deaf.

Children seem to like to work at the machines and maintain attention over unusually long periods of time. Every student must respond every time by pointing, writing, etc. so that there is no turn-taking. The teacher provides constant human reinforcement for every correct or acceptable response. The teacher identifies and corrects every error within a few seconds of its commission.

Although teachers must prepare materials in advance to use with the system, many of them have commented on the absolute lack of correcting to be done after class. All correcting is done as the errors are made.

The system has been used with success by deaf teachers. One veteran teacher commented that he was now having a real dialogue with his students.

The system has been used with success by inexperienced personnel who were otherwise understood with difficulty by the students, and who found it very difficult to understand the students. It may be that aides can conduct review or drill with the system on material taught by a teacher.

Programmed learning materials that are ordinarily used by individual students can be put on overhead transparencies and projected by the teacher's projector for response on the eight student projectors. Of course the advantage of individual rates is lost, but the tremendous advantage of human reinforcement and encouragement is gained. It may be that many project LIFE materials could be used in this way.

The 200 language transparencies produced by NERMCD last year have been particularly useful with this system. (These transparencies were distributed to all schools by Media Services and Captioned Films.) Various ruled and numbered or lettered response sheets are used by the student so that the teacher will know where to look for the answers during the brief scanning period.

Although eight students were assumed to be the proper number to be involved, several trials have been conducted with up to twelve students at overheads simultaneously. It is too early to tell if this number is feasible, but if it were, another revolution might be in the making.

Only a little experimentation has been done with materials for response presented by tapes, discs, audio cards, slides, filmstrips, motion pictures or television. These would seem to provide a variety of stimuli for visual response.

The experiments indicated above are, of course, not in the realm of research. In order to remedy this, a qualified researcher, Mr. Todd Eachus, a doctoral student at the University of Massachusetts, has been employed to conduct rigorous research. This is being done in the area of sentence structure in the primary building at the American School. Preliminary data are very exciting.

It must be pointed out that no claim is made that this system provides more than a part of the deaf child's education. The tremendously important speaking skill is only aided by helping to improve written language facility.

If larger numbers can be drilled with this system, or if less qualified personnel can operate it, it might free qualified teachers for individual speech instruction.

During the coming year we are intent on further experimentation. We plan to set up complete visual response laboratories in about a dozen schools that will provide suitable space and schedule use on a rotating basis. We also plan to create and adapt materials for use by teachers and students. We will conduct demonstrations and research on the effectiveness of alternate modes of use.

Southern Regional Media Center for the Deaf

by William D. Jackson, Director, Southern Media Center for the Deaf

The Southern Regional Media Center for the Deaf is located at The University of Tennessee, Knoxville, and funded under contract with Media Services and Captioned Films Branch, Bureau of Education for the Handicapped, U.S.O.E. Beginning with the first six-weeks Media Institute in the summer of 1966, the Southern Regional Media Center for the Deaf has continued to promote the meaningful utilization of appropriate media in improving education for the deaf. Primary attention is devoted to the design of methods and materials specifically created for teaching the deaf child and to the demonstration of these innovative techniques in schools for the deaf through the twelve states of the southern region. In addition, the Center provides support and assistance to the University of Tennessee's preparation programs for teachers of the deaf, media specialists, and rehabilitation workers; plans and conducts in-service institutes and workshops for professional personnel engaged in education of the deaf population; furnishes consultant services to schools for the deaf and state departments of education within the assigned geographic area; and maintains cooperative working relationships with adjacent Special Education Instructional Materials Centers.

Housed in two adjoining former residences on The University of Tennessee's Knoxville campus--one equipped for offices and graphics design, the other housing the demonstration and production laboratories which also serve special education classes and media workshops, the Southern Regional Media Center for the Deaf is under the administrative control of the Dean, College of Education, with its staff holding rank in the Department of Special Education and Rehabilitation. To assist in setting long-range goals and guiding Center activities for maximum coordination and effectiveness, an Advisory Council has been established:

Ben E. Hoffmeyer, Superintendent, North Carolina School for the Deaf
Chairman
Jack Brady, Superintendent, Kentucky School for the Deaf
Faye Brown, Chief Consultant, Exceptional Children, Alabama State Department of Education
Erelene Bradford, Supervising Principal, Louisiana School for the Deaf
Sara E. Conlon, Consultant, Speech & Hearing, Florida State Department of Education
W. Lloyd Graunke, Superintendent, Tennessee School for the Deaf
William J. McClure, President, Florida School for the Deaf and Blind

Annually thirty teachers of the deaf are selected to come to the Knoxville campus for rigorous training in a Summer Media Institute offering nine quarter hours credit, graduate or undergraduate. During the academic year, staff of the Southern Regional Media Center transport special equipment to individual schools throughout the assigned geographic region and conduct intensive in-service training sessions for teachers and administrators. In 1967-68 alone, for example, 459 persons serving almost 3,000 deaf pupils were reached through in-service workshops on their home campuses. In little more than two years of operation, the Southern Regional Media Center has involved in its activities over 75 percent of the professional staff employed in education programs for the deaf in the twelve states of the region.

A persistent problem encountered by the Media Center staff is that of persuading teachers to demonstrate creativity and to experiment with new ideas utilizing instructional media. One approach found to be successful is that of introducing the idea of visual statements and the "language of pictures." Teachers--inveterate collectors of all kinds of pictures for the classroom--are immediately receptive to this concept. Identification of the visual elements in an advertisement (lettering, captions, space, and illustrations) leads to the process of editing or picture manipulation: the removal of undesirable advertising or the collation of several different pictures, for example. Basic elements of layout and design are explored, and teachers are encouraged to search for appropriate items and create their own displays. Other workshop sessions are focused on "how to" dry mount, laminate, prepare overhead transparencies, and so on. Constant emphasis is placed on the relationship of form and content in instructional materials and also on their relation to the structure of written language and successful adaptation for either individual or group viewing. In summary, all activities of the Center staff--whether engaged in the annual summer institutes, the in-service workshops, or informal consultative sessions--are sharply focused on three specific objectives:

1. To develop an understanding of the relationship of media to learning processes and the application of instructional media to classroom procedures;
2. To develop skills in the design and production of instructional materials particularly effective in instructing the deaf child; and
3. To develop acquaintance with the variety of instructional resources available and sound bases for selection of materials.

Associate Commissioner James J. Gallagher has said, "The job of all educators--including special educators--is to find mechanisms through which we can translate new knowledge into action at the instructional level." In a silent world, the key to knowledge is the translation of visual stimuli into meaningful thought. But to translate visual experiences into the language of the society in which the deaf person must live is a formidable task, and for many decades there had been no significant breakthroughs in deaf education.

Establishment of the Captioned Films for the Deaf program in 1958 provided a beacon of hope for the future and opened the way for dedicated educators to pursue with insight, vigor and determination their dreams of finding better ways to educate the deaf child and prepare him for vibrant participation in the world around him. The concept of resource centers for training teachers of the deaf in the use of new instructional media led to the establishment of four regional centers in 1966. As a wide array of projects and activities were being initiated, it soon became apparent that each of the four Regional Media Center's possessed unique resources and capabilities for design and development of a rather specific area of media. To the staff of the Southern Regional Media Center for the Deaf, video technology seemed to offer unlimited opportunities for deaf education. And so it was decided that the major thrust of the experimental phase of our program would be directed toward these four major considerations:

1. What are the potential uses of television in instructional programs for the deaf?
2. In what ways can television equipment be used effectively in educating the deaf child?
3. What specific problems and limitations are being encountered relating to equipment, facilities, personnel, and curriculum revision?
4. What are the current developments and trends?

Before 1965, interest in television was virtually nonexistent among educators of the deaf. Not only was the cost prohibitive, but television was competing with 8mm film loops, filmstrips, and overhead transparencies at a time when federal aid to educator was more talk than reality. Introduction of a new portable videotape recorder with a price tag under $1,500.00, however, represented a significant breakthrough in the potential applications of video technology to discovering new approaches and new solutions to problems unique to instruction of the deaf child. In recognition of this trend, the Southern Regional Media Center for the Deaf secured a major commitment from Media Services and Captioned Films Branch, Bureau of Education for the Handicapped, to conduct research in television utilization.

A short videotape presentation at the 1968 Lincoln Symposium and publication of a set of guidelines and suggestions based on information and experiences obtained during the first year represented our first attempts to demonstrate some useful applications of television in educating the deaf child and the deaf adult. Immediately we were bombarded with questions from interested administrators: How do we get started? What kinds of equipment do we need? Where do we get the programs? What are the sources of know-how and financial support? In response, the Southern Regional Media Center for the Deaf in April of 1968 sponsored a seminar devoted to the problems of basic technology, planning, preparation, and programs. (Summary report available upon request.) Some schools in the Southern Region are already developing rather elaborate television systems. Random-access, direct-dial videotape programs are being talked about. Captioned videotape and computer-assisted instruction are also being discussed. The Media Center is presently acquiring equipment for captioning any type of presentation--whether on film, slides, tape, received off the air, or live. A new videotape recorder and color monitor permit us to record commercial television programs in color and play them back in color. Eventually we hope to get a low-cost television camera for recording films and slides in color. Meantime, educators of the deaf everywhere are beginning to take a new look at television's potential for instruction and a follow-up television seminar in February 1969 at Knoxville attracted participants from all across the nation. (Summary Report in progress.)

Video technology incorporates all the multimedia devices and techniques utilized heretofore for visual presentation. It utilizes the slide and film projector, incorporates programmed instruction, feeds and displays computerized instruction. It magnifies, standardizes, records, critiques. A televised image--amplified if desired--can be viewed simultaneously in many locations with only one origination point to be controlled, expanding the reach of the individual from one person to one hundred or one million viewers. Videotape is much less expensive than film to produce and (unlike film) can be erased and reused. Television is being utilized everywhere--in industry, in medicine, in space and military programs--and an appropriate system, ranging from simple to complex, can be designed to meet the specific needs of any school for the deaf. Among possible applications in educational programs are these:

1. pupil self-evaluation and motivation,
2. teacher evaluation of pupil performances and self-performances,
3. longitudinal study of student achievement based on date recorded on videotape,
4. pre-service and in-service teacher preparation, and
5. parent education.

Unquestionably, the creative application of video technology can be the least expensive, the most flexible, and the most effective approach to instruction available today.

Southwest Regional Media Center for the Deaf

by Marshall S. Hester, Director Southwest Media Center for the Deaf

For several years, the Southwest Regional Media Center for the Deaf at New Mexico State University in Las Cruces, New Mexico, has carried on in-service training for teachers of the deaf and pre-service training for people preparing to be teachers of the deaf. Also there has been activity in the development of teaching machines. In addition, beginning last summer, activities have been carried on in the area of curriculum improvement including programmed instruction.

The in-service training activities have been carried on by means of short workshops from two to five days duration in day and residential schools for the deaf in the western United States and by means of Project Hurdle in some of the same schools. The short workshops generally consist of intensive activity in inducing teachers to use the overhead projector, the filmstrip projector, the slide projector, the 16mm and 8mm movie projectors and the dry mount press. Teachers are given extensive and intensive exercises in developing materials for use on the overhead projector and with the dry mount press. Generally, two media specialists go to a school, take equipment and materials with them and train the teachers in the use of the devices mentioned. In addition, more recently, simple photography has been introduced, leading some teachers to become quite interested in developing slides for use in teaching their specific subjects. Project Hurdle is carried on by sending to a school a media specialist who is also a teacher of the deaf, to work with teachers in helping them to develop materials for their own use and to become skillful in using the several pieces of equipment available to them. For this project a heat copier, dry mount press, 16mm projector and an 8mm cartridge projector are placed on "long time loan" to the school. Ample materials for use by the teacher are supplied.

The duration of Project Hurdle in a school is related to the number of teachers in the school. In some instances, Project Hurdle has continued for as long as a semester and in others, for only four weeks. The equipment is taken to a school for the project and is left there upon termination of the project. The short-term workshops and Project Hurdle have been conducted in both day and residential schools.

Workshops in centers where teachers of the deaf are trained have been carried on by one or more media specialists depending on the number of trainees in the center. Generally, these specialists have available a truckload of assorted equipment with the related materials. They give the introductory training to trainees or if the trainees have already been exposed somewhat to media, they try to help them with some advanced training. Activities in teacher-training centers run from two days to a week, depending on the training center and the way in which its schedule can be manipulated.

Under a sub-contract with the Speech and Hearing Department of New Mexico State University, considerable work has been done in developing an Automated Reading Monitor System (ARMS Machine). This is a rather complex electronic device which gives promise of being very effective with deaf children. A simple version of the same basic idea in the ARMS machine is under development.

During the current contract year, activity in the area of curriculum has expanded considerably. The curriculum coordinator has been working with committees in several schools for the deaf in developing kits to be used in elementary classes of deaf children. Some of these kits have been completed and have been tried out with considerable effectiveness. The development of kits will be contined during the next contract year. In addition, there have been committee activities related to the revision of certain aspects of the Ball State curriculum guides. During the summer of 1968, two institutes will be held, one in the introductory area for programmed instruction and one at the advanced level. Thirty people will be involved in the Introductory Institute and twelve people in the Advanced Institute.

An Advisory Committee of five members meets twice a year to discuss with Media Center personnel the on-going program and to make suggestions concerning future activities of the Center. Much of the new direction of the Center and the projected new activities have developed from suggestions made by members of the Advisory Committee. In addition, having an Advisory Committee tends to help the schools for the deaf to be better informed about the purposes and objectives of the Southwest Regional Media Center for the Deaf.

Midwest Regional Media Center for the Deaf

by Robert E. Stepp, Director, Midwest Regional Media Center for the Deaf

The Midwest Regional Media Center for the Deaf has been in operation only since September of 1966. However, it has a history that goes back to 1963 when its Director, Dr. Robert E. Stepp, conducted a research project, "A Feasibility Study to Investigate the Instrumentation, Establishment, and Operation of a Learning Laboratory for Hard-of-Hearing Children," under a N.D.E.A. Title VII grant from the U.S.O.E. The study, completed in 1965, drew nationwide attention and led to another grant to continue the effort to develop specialized instructional films for deaf children. Grant funds for this phase, a "Project to Develop and Evaluate Instructional Materials for the Deaf," was provided by Captioned Films for the Deaf. The 1965-66 period was largely devoted to the production of 8mm loop films for teaching the deaf, a Summer Educational Media Institute, and a continuation of the successful "Symposium on Research and Utilization of Educational Media for Teaching the Deaf." In the summer of 1966 a grant was approved for the expansion of this project, and Dr. Stepp resigned his position as Director of the Bureau of Audiovisual Instruction at the University of Nebraska, to devote his time to this important effort. Since then, the Center has negotiated two additional continuation grants for this project and expects to negotiate another for the contined work of the Midwest Regional Media Center for the Deaf through the 1969-70 academic year.

Functions of the Center. There are briefly five functions of the Midwest Regional Media Center for the Deaf. They are:

1. To design, adapt and produce instructional materials for the express purpose of teaching the deaf; and to conduct research into the effectiveness of these materials in an area field testing program.
2. To plan and conduct a Symposium on Research and Utilization of Educational Media for Teaching the Deaf.
3. To plan and conduct several Educational Media Institutes: for college educators who train teachers of the deaf; for teachers of the deaf; supervising teachers; and others who are associated with hearing-impaired children.
4. To continue the area program for schools for the deaf in North Dakota, South Dakota, Nebraska, Kansas, Missouri, Iowa, Minnesota, Wisconsin, Illinois and Indiana by field testing new productions and conducting workshops in the preparation of instructional materials.
5. To provide the service of its staff as consultants and resource people to the teachers and administrators in schools for the deaf in our assigned area.

Achievements in Production. Although production might range from study prints to motion pictures and from audio tapes to video tapes, the initial productions were motion pictures and transparencies, slide sets and training manuals which explained the use of these materials. One other responsibility was to undertake occasionally experimental productions which might lead to the

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development of innovative learning resources for the deaf student.

The following list is divided into three parts: (1) those productions which are experimental in nature and are being used in a field testing program only, (2) those productions which either are or could be available for mass distribution by Media Services and Captioned Films, depending on the availability of funds for duplication, and (3) those experimental productions which are in various stages of development.

Experimental Productions:

1. 30 Fingerspelling variations of the Withrow Speechreading Vocabulary series, 8mm sound, color, packaged for either Fairchild or Technicolor.
2. One film dealing with prepositions intended to assist the learner with the concepts of prepositions, 8mm sound, color, for use with either the Fairchild Mark IV or Technicolor 1000 projectors.
3. Unit Demonstration Set: This sample set of materials was put together to use for demonstration purposes to show how to organize and produce a unit set of multi-media materials. It includes:
    a. one 16mm film for large group use
    b. five 8mm single loop films for small group or independent study use
    c. 150 35mm slides (copied from magazines, still pictures or shot live)
    d. hook and loop materials
    e. 44 transparencies with overlays
    f. tape recordings

    This unit set was developed around the theme "Machinery That Shapes the Earth" and is intended to demonstrate how individual teachers can gather their own material and develop multi-media units.
4. Two 8mm films to help the learner with verb concepts: Shoes and Breakfast

Productions Which Either are or Could be Available for Mass Distribution

5. 75 Withrow speechreading vocabulary films in 8mm sound, color, packaged for either the Technicolor or Fairchild cartridges.
6. 26 Stepp Vocabulary Films from the LLHH (Learning Laboratory for the Hard-of-Hearing) Series. These films deal with Beginning Vocabulary, Left and Right Concepts, and Foods (Breakfast, Lunch and Dinner). Test Films for each set are provided.

7. 20 additional Withrow speechreading vocabulary films in 8mm sound, color, packaged for either Technicolor or Fairchild cartridges.

8. Five test films for the Withrow Speechreading Vocabulary films in 8mm sound, color, packaged for either Technicolor or Fairchild cartridges.

9. 10 Cued Speech lessons in a silent Technicolor format. (25 cartridges) This series was planned as instructional material for teachers.

10. 22 Teacher-designed transparency sets. These sets are not intended to be a comprehensive unit but are "starter sets" to show how teachers can develop learning materials for their students. Each set contains a study guide, a varying number of transparency masters (10-30) and some sets have opaque masters for use as silhouette cutouts on the overhead projector. Following is a list of the 22 sets. They are not intended as a complete series nor are any of the individual sets intended to be comprehensive in themselves.

I. Anatomy - Part I
II. Anatomy - Part 2
III. Animals
IV. Clothing for Men
V. Clothing for Women
VI. Communication
VII. English - Children's Literature
VIII. English - Colloquial Expressions
IX. English - Comparative Adjectives
X. English - General
XI. English - Language Arts
XII. Foods
XIII. History
XIV. Holidays and Seasons
XV. Home Economics
XVI. Left and Right
XVII. New Elementary Math
XVIII. People and Places
XIX. Science
XX. Sports
XXI. Tools
XXII. Transportation

11. 20 Cued Speech Films; this series was developed for use by parents. It is 8mm, color, sound, for the Technicolor 1000.

Productions in Various Stages of Progress:

12. One 8mm film on Trucks to assist the learner with the concept of verbs.

13. A sample set of tachistoscopic slides shot from full color art work, (4-6 discs).

14. Two experimental films to assist the learner in language development in which shapes and their relationships are explored.

15. A study on comparative programmed learning sequences consisting of the same program presented in the following formats:

a. Print - Programmed Book
b. Min/Max
c. Auto-Tutor
d. Mast Teaching Machine

16. Dialogue Films: These productions are being planned to be open-ended dramatizations that pose questions or situations and leave the solution to the viewer. These films might be used for motivating classroom dialogue.

17. The film-study program. This approach utilized the following materials which demonstrate another way to put a unit together:

    a. 16mm motion picture, "Profiles in Courage: Mary S. McDowell"
    b. print format programmed learning sequence to help deaf students learn the vocabulary used in the film
    c. a student handbook consisting of excerpts from various sources expressing the reactions of Mary S. McDowell's contemporaries to her attitudes about war.
    d. a teaching guide which suggests ways in which the materials may be used
    e. a 16mm motion picture (using an on-screen interpreter for the deaf) of a panel discussion relating the situation of Mary S. McDowell to today's values.

The Center staff has also provided assistance for the Illinois School for the Deaf film production, "Tomorrow's Schools Today." Recently the Center was involved in the production of a 16mm film for the Bureau of Education for the Handicapped in which Dr. James Gallagher, Associate Commissioner, Education for the Handicapped; Dr. Leon Lessinger, Associate Commissioner, Elementary and Secondary Education; and David Denton, Superintendent of the Maryland School for the Deaf; explained and discussed the purpose of P.L. (Public Law) 89-313 and Title I funds.

Symposia. Five symposia on Research and Utilization of Educational Media for Teaching the Deaf have been held at the Nebraska Center for Continuing Education, Lincoln, Nebraska. They are jointly sponsored by our Center and the Department of Educational Administration, University of Nebraska, and supported by Media Services and Captioned Films. The themes of each of these conferences are listed below. The Symposia have been planned specifically for administrators, supervisors, and directors of educational programs for the deaf student.

1965 - General Media Projects in the Area of Education for the Deaf

1966 - Systems Approach in Education for the Deaf

1967 - The Educational Media Complex

1968 - Designing Instructional Facilities for Teaching the Deaf

1969 - Individualizing Instruction for the Deaf Student

The discussion papers and major addresses are disseminated in the form of a final report of the conference, and this report also appears each year as the November issue of the American Annals of the Deaf.

Institutes and Workshops. Eight major institutes and seventeen workshops have been conducted by our Center. They are designed for the teacher of deaf students. The main objective is to prepare teachers to become media specialists in their own schools, and to become skilled in media utilization in their teaching. The 1968-69 year brought an additional institute designed for the college educator who trains teachers of the deaf. The purposes of this institute are three-fold:

1. to acquaint the participants with the latest forms of educational media and technology and their implication for utilization in education.
2. to determine areas in which educational media and technology may be used in the courses they teach, and
3. to ascertain the competencies and skills that teachers in training should have in the design, production, and utilization of educational media prior to graduation.

The summer institutes were six weeks long, and the "teacher-trainer" institute was held for one week in the fall and one week in the spring.

In addition to the symposia designed for administrators, and the institutes designed for teachers and college professors, the Center has been conducting two-day workshops which are part of the in-service training program offered to schools in our area program. Workshops have been conducted in the following locations:

a. Nebraska School for the Deaf, Omaha, October 1966
b. Kansas School for the Deaf, Olathe, February 1967
c. Iowa School for the Deaf, Council Bluffs, April 1967
d. South Dakota School for the Deaf, Sioux Falls, April 1967
e. North Dakota School for the Deaf, Devils Lake, April 1967
f. Central Institute for the Deaf, St. Louis, Mo., September 1967
g. Special Ed. Dpt., Minneapolis, Minn., October 1967
h. Indiana School for the Deaf, Indianapolis, October 1967
i. Wisconsin School for the Deaf, Delavan, November 1967
j. Special Ed. Dpt., Chicago, Illinois, January 1968
k. Special Ed. Dpt., Kansas City, Mo., January 1968
l. St. Joseph's School for the Deaf, Fontbonne College, St. Louis October 1968
m. Special Ed. Dpt., Chicago, Illinois, January 1969
n. Illinois Supervisory Personnel, Lincoln, Nebraska, January 1969
o. Minnesota School for the Deaf, Faribault, February 1969
p. Ball State University, Teachers in Training, Muncie, Ind. February 1969
q. Missouri School for the Deaf, Fulton, April 1969

Philosophy and Goals. Many changes have taken place in education of the deaf over the past few years. These changes are far-reaching and numerous, and few would argue with the assumption that we are in the stages of an educational revolution. Many forces are at work in promoting these changes. It is possible that we are simply being engulfed in the rising tide of instructional technology that is sweeping the general education scene. On the other hand, in education of the deaf the need is greater and the climate for innovation is more favorable, and there is every reason to believe that we should be in the vanguard of these new developments.

More effective learning programs are required by the era in which we live. The requisite increase in learning cannot be accomplished with our traditional installations and instructional methods. In the education of the deaf the question is no longer, "Should we?" but the question is, "How do we go about it?"

Educational media has a unique role to play in education of the deaf. According to both Dr. John Gough, former Chief of Media Services and Captioned

Films, and Mr. Gilbert Delgado, Acting Chief of that same agency:

> Utilization of new means of communication, ranging all the way from individualized programmed instruction to mass communication through open or closed circuit TV, opens new possibilities in every aspect of the struggle to overcome the handicapping effects of deafness. The ways in which academic, vocational, social, cultural, recreational, and spiritual needs of the deaf population are met can be significantly changed and improved through emergent technology. The potentials of the new communication media are so great as to over-shadow the rival claims of special methods controversies which have dogged this field these last 100 years.

Individualized learning systems, if employed, will require a restructuring of course content, the establishment of a new relationship between teacher and student, the formation of new standards and goals, and an involvement with educational media hertofore not envisioned. It is recognized that the hearing handicapped child achieves at a rate slower than his hearing peer. In many teaching situations the deaf student stops learning when the teacher stops teaching. Many of our current methods are causing the deaf student to become dependent. One factor contributing to the delayed development of the deaf student may be his dependence on other people for his education.

How does individualized learning affect design on instructional materials? If the learner is to have any emotional reaction or is to feel any sense of involvement, how does this change the format and style of preparing materials? Most print and projected materials are produced with the learner serving only as a viewer. If the materials are to evoke a response from the student, how does this change the content of the visual, the perspective of the scene, the design or shape of the item, and the wording of the title or caption?

Both teachers and students should be able to develop messages and create response media. Students should be encouraged to use and produce all types of instructional materials as part of their expressive language. Incidental but essential, to message design is the need to know how to produce materials, operate equipment, select resources and evaluate all forms of media. The real secret in the utilization of media is to employ the resources as learning materials and not as teaching materials.

McLuhan and Leonard writing in the February 21st issue of Look magazine expressed this thought as follows:

> The student of the future will truly be an explorer, a researcher a huntsman who ranges through the new educational world of electric circuitry and heightened human interaction just as the tribal huntsman ranged the wilds. Children, even little children, working alone or in groups will seek their own solutions to problems that perhaps have never been solved or even conceived as problems.

The teacher in this type of educational environment will become the learning mentor, serving as a guide, counselor, and director of the learning experience. A new method of teaching is evolving. Perhaps the salvation for the deaf child may rest within the child himself. What could he learn on his own if given the right opportunity, in the right environment, with the proper materials programmed to challenge him. The hearing-handicapped child, like any child, should be allowed to succeed or fail on his mental capacity and not on his hearing deficiency. Individualized learning provides this type of opportunity to the hearing handicapped. The challenge is to the educator who must select, prescribe, program, and evaluate the learning experience and to that end the Midwest Regional Media Center for the Deaf is dedicated.

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CHAPTER II

BETTER ORGANIZATION OF THE EDUCATIONAL ESTABLISHMENT TO AID THE HANDICAPPED

by

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After spending one year as the Director of Psychological Services at Dayton Hospital for Disturbed Children, Dayton, Ohio, Dr. Gallagher held a job for three years as Assistant Director of the Psychological Clinic at Michigan State University, East Lansing, Michigan. In 1954, Dr. Gallagher began his tenure at the University of Illinois in Urbana. Following three years of work as an Assistant Professor in the Institute for Research on Exceptional Children, he became an Associate Professor. A final promotion made him the Associate Director of the Institute from 1963 to 1967. Dr. Gallagher served as a Visiting Adjunct Professor in the Duke University Education Improvement Program during 1966-67.

Publications to Dr. Gallagher's credit include: Teaching the Gifted Child; "The Tutoring of Brain Injured Mentally Retarded Children: An Experimental Study;" "Child Development Monographs;" and "The Productive Thinking of Gifted Children in Classroom Interaction."

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BETTER ORGANIZATION OF THE EDUCATIONAL ESTABLISHMENT TO AID THE HANDICAPPED

I would like to spend my time with you tonight talking about a tool or a mechanism for accomplishing more thoroughly the educational goals for deaf children and all handicapped children. The mechanism is the Bureau of Education for the Handicapped in the Office of Education. The Federal operation has been called many things, one of the kindest terms used has been that of catalyst. That is our aim.

Over a period of years, as I have come to look at various kinds of organizations and groups, I am repeatedly surprised about how many analogies I can draw upon in comparing the large Irish family in which I was raised, and the various groups and sub-groups in education. St. Patrick's Day would seem to be an appropriate time to reflect upon this experience.

My mother's family had 13 children. As a result, holiday family affairs always resembled a scene of unimaginable confusion. Nevertheless, all the necessary things seemed to happen and work out properly, including a dinner where usually forty or fifty persons were seated, and the largest bird this side of the Rockies was carved up to satisfy the hunger pangs of this huge crowd.

There are many things I can reminisce about in this Irish family. I can remember that there was usually substantial strife between certain members of the family, and sometimes that strife got rather bitter. At the same time, all of the members of the family were able to unite against any outside threat to the family and present a united, strong, and aggressive front to the outside world. One of the big problems in the family had to do with in-laws who must have felt that they were coming into a closed corporation. Indeed, the difficulties of being an in-law under these circumstances were very substantial. I have noted some similarities between other more famous large Irish families and my own and have come to the conclusion that it is a cultural--not an individual experience.

As I grew older, I noticed some of the shortcomings as well as some of the virtues of this family arrangement. One is that the defensive posture of the family against the world kept us from enjoying the fruits of the heritage of many other cultural groups. For example, one can be deprived of enjoying the Italian's love for art and music, or the love of knowledge and the appreciation of the intellect of the Jewish community, to say nothing of the dry wit of the English--which like anything else British, was not acceptable at all in an Irish family. Many times, unless one is a member of the family, it is hard even to attract the attention of the family itself.

In the field of the deaf, I see myself as an in-law, but very much interested in the family of the deaf. I can see the rival internal tensions within the family itself, and at the same time I can recognize the fierce loyalty of the deaf to their own area. This family feeling is at one and at the same time a virtue and a problem that my family and your family have.

I think it's time to ask ourselves, "How can we keep the many advantages of the family and, at the same time, grow and prosper and profit from ideas that come from outside the family itself?" In-laws may help, but they do not solve the problem entirely. The family as a societal unit would be hard put to survive on its own in current society. Consequently, we have to look for a means to adjust and work with the larger systems that modern life has imposed on us.

In terms of the need for a more systematic attack on the problems, I can refer back to the Babbidge report which catalogued a wide variety of unmet needs and concluded:

> "This unsatisfactory state of education of the deaf cannot be attributed to any lack of dedication of those who teach and work with the deaf. The basic explanation lies in our failure to launch an aggressive assault on some of the basic problems of language learning of the deaf through experience or well-planned and adequately supported research, and in our failure to develop more systematic and adequate programs for educating the deaf at all levels."

One of the necessary prerequisites for all areas of the handicapped is to utilize to greater advantage those larger ideas that enhance and enrich our understanding of the behavior we observe in handicapped children. It is very difficult to find comprehensive research programs and projects that draw upon the increasing body of theoretical concepts and knowledge available in the behavioral sciences, and apply it meaningfully to the area of the deaf, the blind or the cerebral palsied.

I recently saw a research proposal that was rather special in a number of ways. It drew heavily upon some research and conceptualizations applied to the classroom. Chomsky's transformational generative grammar is proposed as a model for the study of comprehension and production of syntactic structures of deaf children and youth. The proposal lays out a five-year series of projects around this central theme. Without discussing the actual merits of any particular porposal, we can say that our experience in other areas of the handicapped would suggest that such programmatic approaches built upon a firm conceptual base and a stable research team would seem to have the greatest chance of paying dividends.

Even more absent are any efforts based on the social learning of Bandura or Rotter. If entire patterns of behavior are adopted, as these investigations maintain, through the imitation of older children or adults with whom they can identify, whom they respect, and who have power over them, then what are the implications of this area for the deaf child? What does the absence of substantial linguistic skills do to the social imitative process?

Part of the total system on the improvement of educational programs for the deaf lies in the oft-stated need for leadership personnel in the area of the deaf. We carry this as a high priority in our training program, and particularly have and need to increase the number of persons being trained for leadership positions at this level. While we support fifty programs of training in the area of the deaf and even with this priority in mind, however, we find ourselves not able to significantly improve the number of awards given to approved colleges and universities. The number of fellowships at the post-masters level raises from about 10 to 17. This suggests again, that some more substantial planning and different patterns of aid to the doctoral programs in this area are going to be necessary.

One aspect of the development of a total system of education will involve the more effective use of research money in supporting programmatic research in educational curriculum development and in appropriate areas of behavioral sciences. The Bureau of Education for the Handicapped stands ready to support long-range and concentrated efforts in this regard.

More than that, the content and philosophy of the training programs appears to be changing. The best indicator of that desire for curriculum change in training programs for the deaf is seen in a summary report of our consultants in this area that suggests the many applications for Federal grants which reveal coursework and practicum deficiencies, poor program organization, and inadequate and/or poorly-qualified staff.

Serious effort must be devoted to measures to strengthen many existing programs and to raise the overall quality of teacher preparation in education of the deaf. In addition to these important measures, there must be exploration of new concepts, such as a) the use of packaged courses, course segments, and demonstrations prepared by experts in various areas and utilizing a wide range of available media; b) the use of auto-instructional devices and programmed instruction in university classes; c) the development of consortium arrangements between institutions to allow each to benefit from the strengths of the others.

The School System

As we look at our schools in the last one-third of the twentieth century, we must start with the realization that there never has been an educational system in the sense of an organized and unified entity. Instead, there has only been a collection of unconnected service units, each with its own special version of quality service. In the evolution of our educational system, there has been no effective approach toward creating a system that would involve an effort to interrelate research, development, demonstration, dissemination, training, and direct services. If there is anything that presents a serious priority for funding agencies, it is those kinds of activities which will lead to a more effective educational system.

What resources does the Bureau of Education for the Handicapped have, and what can it do to encourage constructive activities in blending the systems of special education? The Bureau is a tangible reminder of the changed status of the handicapped at the State and Federal levels. Established in January 1967, the Bureau administers those programs devoted to educational programming for the handicapped through the U.S. Office of Education. "Handicapped" in Federal legislation refers to mentally retarded, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, crippled or other health-impaired children, who by reason thereof require special education.

This group of children makes up 10% of the Nation's school age population, or over 5,000,000 children. For many years, there was only a handful of employees in the Office of Education concerned about education for the handicapped. Today, there are over one hundred employees, and we operate with an annual budget of more than $100 million. The Bureau of Education for the Handicapped has three operating divisions, representing a broad spectrum of activities in the field of educating handicapped children.

The Division of Research supports investigators and organizations in research and related areas designed to produce the maximum educational benefit for the handicapped. With the $12.8 million appropriated in the fiscal year 1969, over 100 investigators were supported, a major research and demonstration center was established, and over $2.5 million has been invested in a network of 14 Instructional Materials Centers designed to make readily available to teachers of handicapped children the latest in materials and media. During this year we hope to fund more Research and Development Centers, which will concentrate efforts on major problem areas in education for the handicapped.

The Division of Training Programs provides support to institutions of higher learning and to State educational agencies so that programs for the preparation of special education personnel can be supported or expanded. In the fiscal year 1969, $29.7 million will be awarded to 261 public and private non-profit institutions of higher education and to State education agencies in all 50 States, the District of Columbia, Puerto Rico and the Virgin Islands, to provide support for undergraduate and graduate students and the university training programs that prepare such specialists. Over 18,000 students will receive part-time or full-time support to improve their abilities to deal with the difficult educational problems of handicapped children.

The Division of Educational Services provides for the distribution of resources to assure that educational services for the handicapped can be initiated, expanded, or extended at the local and/or state educational levels. In fiscal year 1969 over $60 million was committed to improve the educational programs for the handicapped in the states and in institutions throughout the country.

In addition to these three divisional units we have a Program Planning and Evaluation Staff, an Information and Reports Staff, and a Program Implementation Staff connected with the Bureau.

The substantial contributions made through the Captioned Films program are well known to this audience. Generally, the application of media principles to the deaf can be seen through development and dissemination projects such as Project Life, that applies a multimedia approach in developing language for deaf children. We begin to see evidence that deaf children can rapidly and effectively learn large chunks of language through machine instruction reinforced by the large array of supplemental media materials.

Another major effort is the Southwest Regional Media Center's "special" focus on curriculum with an emphasis on programmed learning and instructional systems. Ten teams consisting of a supervisor and teacher attended a six-weeks training institute in Program Instruction Systems last summer. A team from the Center follows this up, serves as a clearing house for exchange and validation of Program Instruction materials developed by the teachers. This summer a similar introductory institute will be held as well as an advanced program.

The bringing together of the total Bureau effort brings other research and development activities to bear on major educational issues.

One of our current research projects involves the study of man-machine communication systems for the handicapped. Developments such as the cybertype enable children with the use of only two digits to reproduce the typewriter keyboard. The cyberphone will permit the deaf and individuals with speech impediments to communicate via the telephone. Using standard telephone lines and a standard telephone instrument, the sender can type a message that will be received and be typed out on the receiver. These messages can also be received on a cyberlamp which can either display the typed message on the typewriter, or provide a visual display of the manual alphabet which has been excited by the sender's typed message. Such devices open up a larger vista than merely improving existing communication channels. They stimulate thought about how existing communication systems such as braille can be improved.

One of the ways in the which the deaf family and most areas of the handicapped have insulated themselves has been in failing to pay attention to the significant curriculum innovations for the normal child which is financed mainly by the National Science Foundation in the fields of mathematics, science, social studies and language arts. In these areas, advanced curriculum methods are being tried in an effort to systematize and organize experiences of students to give them a greater grasp of the more fundamental ideas lying at the heart of each of these "knowledge" disciplines.

One would think that the great output in terms of the new math and the new sciences would be eagerly adopted, or at least adapted by persons working in the field of education for the handicapped. Instead, with minor exceptions, we find that the "family" remains relatively untouched by these experiences.

One of our attempts to extend our knowledge and services in this area lies in a proposal now receiving serious consideration, and it calls for a major attempt to adapt some of the new science materials already produced by nationally known scholars and endeavor to fit them to the particular learning needs of handicapped children. In this way, original curriculum efforts will be supported, and we hope it will provide a resource system on instructional materials that will eventually match in excellence the sophisticated dissemination system and media that can be seen in the Regional Media Centers and in the general Captioned Films Program. In a sense we can relate this to a transportation system which is not worth much if it has no goods to transport. Yet it will take a substantial effort to make certain that these goods will be produced and move over the transportation system.

Service Applications

Much of what we are doing at the research, demonstration and training levels we hope will show itself in on-going educational programs so that the new, the exciting, and the innovative will become a part of next year's educational program. In Public Law 89-313, aid to state institutions in Fiscal Year 1968, we are providing over $3 million in 82 separate projects that serve more than 15,00 children. We have provided help to schools so that they can employ 900 staff personnel, obtain new equipment, and give heavy emphasis to in-service training, preschool programs and curriculum enrichment.

Under Title VI-A of the Elementary and Secondary Education Act we have a program designed to help the states extend and expand their programs for handicapped children. Under that program, additional services are being provided for the deaf. Hopefully these services have provided benefits by the variety of work being done in research, training, demonstration and dissemination activities being conducted in other parts of the "erstwhile" system.

Hard of hearing and deaf children make up at least 7% of the total, or about 4,000 children being served. Over 250 teachers are being salaried under this program, and another 1,200 have received additional in-service training. Several projects involving hard of hearing and deaf children have been cited as outstanding examples of projects under this program. For example:

Gaston, North Carolina--A preschool program for 24 deaf and hard-of-hearing children to continue development of communication skills and of the child's physical, social and emotional growth. This program and the Wake County program represented the first public school preschool program in the state.

California State Department of Education--Evaluation of equipment for instruction of deaf and hard of hearing. This program involves purchase, analysis, demonstration and evaluation of relative educational merits of selected amplification units for use with handicapped children. The program made possible the preparation and distribution of a Consumer Report for teachers of deaf and hard-of-hearing children.

Portland, Oregon--A summer evaluation and training program for deaf-blind preschool aged children. The project provided a comprehensive medical and educational evaluation on preschool age children considered to be deaf blind. A day-school program included: pre-language communication abilities, orientation mobility, self-care skills, and parent involvement.

It is a sobering thought that a present six year old handicapped child now entering into a special educational environment will leave school in 1980, or later, and that the world in which this child must make an adjustment will have changed radically from the one we know today.

If we are to start planning effectively for anticipated change, we must be aware of some of the major dimensions that can reasonably be predicted on the basis of visible and meaningful trends.

Long range planning and development of future programs must consider not only present problems, but what the state of the school, family, and society will be like at some future point in time, so that the projections made based on our present problems are not outdated before they have become a reality.

Following are some examples of these thought provoking trends:

1. There may well be a substantial increase in multiply handicapped children, because as our health services improve the survival rate of children at birth will increase--but we will be less able to reduce the number of handicapped children as a result of intrauterine damage.
2. As the general population increases there will be approximately the same percentage of handicapped children, but there will actually be more handicapped children.
3. The handicapped person will face increasing difficulty in the job market since jobs in 1980 will require much higher levels of skill and academic training. It follows from that we will need more sheltered workshops, or other partially supported occupational settings.

4. There will be an advanced technology in a number of dimensions which will provide increased capability for sensory stimulation for those who are visually or auditorily handicapped.
5. There will be earlier identification of handicapped children and a great increase in pre-school programs for the handicapped child.
6. School programs will be involved with all dimensions of health, educational, social and emotional development. One may expect to find more diversified roles in the educational setting to replace the current limited roles of school staffs of teachers, principals, and superintendents, with occasional psychologists and reading specialists.
7. We can expect that the Federal role in support of education will increase gradually in terms of financing and responsibility as the national commitment to educate all handicapped children becomes more clearly defined by our society.
8. We should expect major research developments in the genetic area that will help reduce or eliminate certain easily identified negative genetic factors that produce conditions such as mental retardation and deafness. Since most of these genetic and related conditions are extremely rare, the total incidence of the handicapped will not be substantially affected.
9. The influence of the family will continue to have a relatively declining role, and our society will increasingly assume responsibility for the care and treatment of the handicapped or citizens who are in trouble, and others who are potentially dependent.

10. One should expect to find a greater proportion of organizations present in the total educational system. Each of these organizations will be designed for different purposes. It is likely that there will be more diagnostic and evaluative centers, research and development centers, demonstration projects, etc. These will supplement regular educational programs and provide effective models for educational modification and change.

11. The increasing network of communications would link more closely the various parts of the country and permit rapid interchange of technical and professional skills. The gap between the best and the worst programs should be meaningfully reduced.

12. The continued development of automation increases the likelihood of computer-assisted instruction and automated self-instruction devices. These devices will play a supporting role in a number of educational programs. An added implication to the advances of technology is that more and more people will find a satisfying career in developing instructional materials that are to be placed on these machines, since we already know that the software is harder to provide than the hardware.

13. A much greater flexibility in school architecture of the future will provide for a variety of specialized services and instructional settings ranging from the individual, to small groups and very large groups. These are merely samples of some of the factors that need to be included in our future plans and projections. It may well be that we should invest in a professional projection analysis as part of our long-range planning operations.

Our families have many challenges in these complex days ahead. The past is prologue, but valuable to draw upon and we cannot afford to lose our sense of history. But as to building a systems capability and organization for deaf education, or education in general, there is little history to guide us, so we must learn from others and all participate in the difficult construction job ahead. The deaf have clearly led the way in the media field and have much wisdom to give all of us in systems design there. We hope from the Federal level that the term "catalyst" will be the predominant term used to describe our efforts in this regard.

CHAPTER III

A SYSTEM FOR INDIVIDUALIZING EDUCATION: INDIVIDUALLY PRESCRIBED INSTRUCTION

by

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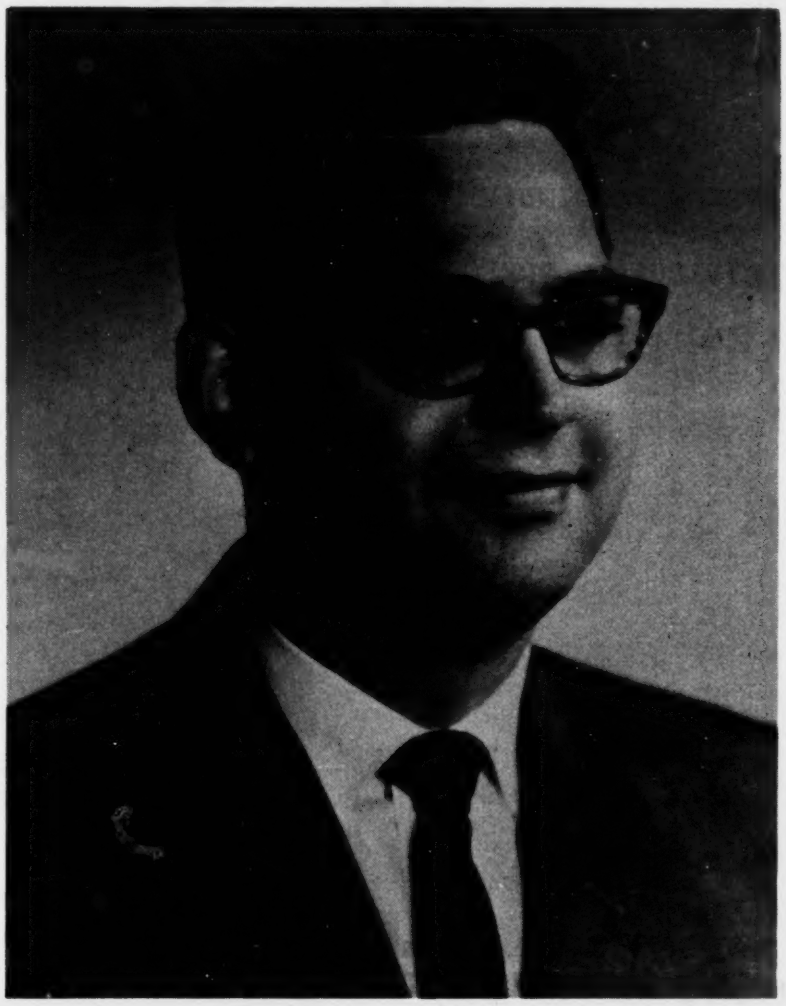

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Before coming to the University of Pittsburgh in 1963, Dr. Yeager spent several years in the classroom as a high school mathematics teacher.

Author of a number of articles published in professional journals, Dr. Yeager has also served as consultant on a number of research projects. He is a member of the American Educational Research Association, the National Council of Measurement and Evaluation, the AAUP, the Pennsylvania Educational Research Association, the Society of Research Administrators and Phi Delta Kappa.

A SYSTEM FOR INDIVIDUALIZING EDUCATION

INDIVIDUALLY PRESCRIBED INSTRUCTION *

The history of education has been marked by many examples of procedures that have been developed to accommodate the needs of the individual student: the Dalton plan, team-teaching, non-grading, Winnetka Plan, programmed instruction, etc. While each has had some success in resolving the problems encountered in individualizing instruction, for the most part these efforts represent only limited attempts to confront the uniqueness of each child's learning style and needs. Possibly one could hypothesize that most instructional or organizational modifications that have been designed to assist in providing a program that is more suited to individual differences have been concerned with only a part of the total instructional system: teacher training, curriculum, procedures, etc. Few attempts have been made to consider instruction as a system comprised of a number of sub-systems that must each be studied and evaluated in order to assess their relative contribution to the system itself.

In order to develop an instructional system that would be highly adaptive to the needs of each individual learner, the Learning Research and Development Center at the University of Pittsburgh, in cooperation with the Baldwin-Whitehall School District, initiated the Individually

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Prescribed Instruction study (IPI) in 1964. The aims of the IPI system are: (1) to provide instruction that is adapted to reliably assessable individual differences among learners, (2) to develop mastery of subject matter as the child moves through the curriculum, (3) to develop self-directed and self-initiated learners through instructional procedures which provide for self-selection and self-evaluation, and (4) to provide opportunities for the child to become actively involved in the learning process.[1] To direct the development of this system, the following principles were established as guidelines:

1. The objectives to be achieved must be spelled out in terms of desired pupil behavior.

2. To the extent possible, instructional objectives should be ordered in a sequence which makes for effective pupil progression with a minimum number of gaps or difficult steps and with little overlap or unnecessary repetition.

3. If pupils are to work through a curriculum on an individual basis, it is essential that instructional materials be such that pupils can learn from them without constant help from a teacher and can make steady progress in the mastery of the defined objectives.

4. In individualized instruction, care must be taken tc find out what skills and knowledge each pupil possesses and to see that each one starts in the learning sequence at the point which is most appropriate for him.

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[1] Bolvin, J. O. and Glaser, Robert: "Developmental Aspects of Individually Prescribed Instruction", Audiovisual Instruction, National Education Association, p. 829, October 1968.

5. For individualized instruction, conditions must be provided which permit each pupil to progress through a learning sequence at a pace determined by his own work habits and by his ability to master the designated instructional objectives.

6. If instruction is to be effective, it must make provisions for having the student actually carry out and practice the behavior which he is to learn.

7. Learning is enhanced if students receive rather immediate feedback concerning the correctness of their efforts in attempting to approximate a desired behavior.

8. The final criteria for judging any instructional sequence must be its effectiveness in producing changes in pupils, and feedback concerning pupil performance should be used in the continuing modification and improvement of materials and procedures.[2]

The implementation of these principles into an operational instruction program has been of primary concern to the LRDC and Baldwin-Whitehall staffs during the past five years. The Oakleaf School, designated as the Experimental School, was designed as a flexible instrument facility with some features seldom found in conventional school buildings such as small conference rooms, material centers, and movable partitions. However, it was not designed specifically for the demands of IPI instruction.

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[2] Lindvall, C. M. and Bolvin, J. O.: "Programmed Instruction in the Schools," in P. Lange, Programmed Instruction, Sixty-Sixth Yearbook of the NSSE, Part II, Chicago, Illinois, University of Chicago Press, 1967.

The present instructional pattern in the school includes IPI procedures in mathematics and reading in grades one through six and sciences in grades one through three with all remaining subjects taught by more conventional methods. A period of approximately 45 minutes is designated for instruction in each subject in which IPI is used.

This discussion of the development and operation of the IPI program will, for the purpose of brevity, be limited to the area of mathematics and will be discussed in the contexts of Curriculum Development, Instructional Procedures, and a Management Information System.

Curriculum Development

The curriculum development activities associated with IPI consist of the sequential development of objectives, the development of testing instruments, and the selection and production of instructional materials. Initially, existing mathematics curricula were surveyed and a composite statement of general content was defined from which a comprehensive set of behaviorally stated objectives were derived. These objectives were then sequenced according to a system of 13 topical areas across increasing levels of complexity. Figure 1 represents the general pattern of this organization. The intersection of each level and topic represents a unit of work which is defined by the specific behavioral objectives that comprise it. For example, the unit, C-Addition, located at the intersection of the topic Addition and Level C, consists of the following set of objectives.

1. Does column addition with two addends for any two or three digit numbers, no carrying. Checks addition problems by adding in reverse direction.

Topic	Level A	B	C	D	E	F	G	H
Numeration	x	x	x	x	x	x	x	x
Place Value		x	x	x	x	x	x	x
Addition	x	x	x	x	x	x	x	x
Subtraction			x	x	x	x	x	x
Multiplication				x	x	x	x	x
Division				x	x	x	x	x
Combination of Processes			x	x	x	x	x	x
Fractions	x	x	x	x	x	x	x	x
Money		x	x	x	x	x		
Time		x	x	x	x	x	x	
Systems of Measurement		x	x	x	x	x	x	
Geometry		x	x	x	x	x	x	x
Special Topics			x	x	x	x	x	x

Existing units are marked with an x.

Figure 1

2. Solves column addition problems with three or more addends and sums to 20.

3. Places >, <, or = between two addition expressions to show their relationship. Sums to 18.

4. Adds three single digit numbers in two different ways to illustrate the associative principle for addition. Puts in parentheses to show which numbers are added first. Sums to 12.

5. Adds two numbers to sums of 20 using expanded notation. At its inception, this sequence was structured on the basis of a logical analysis;

as a part of the development process various tests of empirical and operational validation have been performed that provide a more sound foundation on which a selected number of sequence modifications have been made.

An integral part of the curriculum development work of the IPI system has been the development of a comprehensive testing program. Since one of the principles of the IPI was to have each student work at a point in the curriculum that was suited to his particular learning requirements, a series of placement tests were constructed. As the name implies, the placement tests are designed to place the student at an appropriate point in the sequence. These instruments are designed to test a sample of the objectives within a given level. In this manner, on the basis of his performance, a student would be placed at a particular level of work for a specific topic.

For each unit of the curriculum, pre- and post-tests were constructed. The pre-unit tests are designed to serve as a diagnostic instrument that would provide a detailed assessment of the student's needs within a finely structured plan; the post-test is constructed to determine if a student has mastered the unit's work. In addition, there are a series of curriculum-embedded tests, each designed to test mastery of a given objective. After a student has successfully mastered each of the curriculum-embedded tests for those particular objectives that he has been assigned, he takes the post-test, which provides a total unit evaluation and is scored in the same manner as the pre-test. In order to evaluate a student's performance on any of the testing instruments, a proficiency level defined in terms of a given percent of items correct, has been established for each objective. That is, to have successfully mastered the unit, a student must reach the specified criterion level before moving on to the next higher objective. This testing program is one of the most important components of the IPI system and it provides the diagnostic and evaluative information necessary to determine a student's path and progress through the curriculum.

The LRDC staff and the Oakleaf teachers surveyed existing materials in order to identify materials that met the specifications of each objective. For those objectives where commercially available materials were either inappropriate or non-existent, the staff prepared materials. As the IPI program has developed, a number of revisions have been made to provide a greater variety of learning experiences and techniques of instruction, such as the use of language masters, manipulative devices, and disc phonographs. Work in development of instructional materials, like all facets of curriculum development, continues as an "open-ended" process in its attempt to develop the greatest possible variety of learning modes and experiences, and to make the materials for each lesson as effective as possible.

Instructional Procedures

Basic to the IPI instructional procedure is the system for developing individualized lesson plans, or "prescriptions", for each student as a basis for his study on each objective. To explain how this is done, let us assume that a student is ready to begin work in level D-Multiplication.

Prior to starting work in the multiplication unit, the student would be administered a unit pre-test to determine the exact objectives in which he was deficient. In many instances, because of his entering behaviors, a student may not have to work all the objectives in the unit. For example, if a student had demonstrated mastery of objectives 1, 2 and 4 of level D-Multiplication, on the pre-test, he first would master objective 3 before moving to objectives 5, 6 and 7. Based on the pre-test results, the student's perceived ability, and the teacher's specific knowledge of the student, a prescription would be prepared cooperatively by the teacher and the student. The prescription would assign a number of learning experiences to the student. In this case, the student's prescription would indicate that he is to work with objectives 3, 5, 6 and 7 in level D-Multiplication. The particular experiences that are assigned typically represent from two to five days work and are comprised of a variety of activities and/or learning situations dependent upon the needs of the student or the demands of the objectives which are to be completed independently in a tutorial or small group context. These may include paper and pencil lessons, taped lessons, filmstrips used by the student working independently or with other students in a small group of 5 - 10 students. Once the prescription has been assigned, the student is responsible for carrying out the activities that are designated: assembling the necessary materials, going to the assigned working area, and actively engaging in the learning tasks. Once he has completed the prescribed assignments, he either checks the work himself or takes it to a teacher aide for assistance in checking it. These results are then examined by the teacher and a new prescription is assigned. If the student has demonstrated his ability to master the work, he is then administered a curriculum-embedded test. If he does not successfully complete the first part of the test, he is assigned another prescription which provides him additional learning experience for the same objective. If he successfully completes the first half of the test, he then is assigned to the next objective in which lack of proficiency was evidenced. Since some students can transfer or generalize from one objective to another, it is desirable to again check his proficiency in the next objective. Therefore, the second half of the curriculum-embedded test indicates whether he should be assigned a series of learning experiences in the next objective or whether he can go immediately to the curriculum-embedded test for that objective. When the student has completed all the objectives that comprise a given unit through a series of sequential prescriptions, his total record would be analyzed and he would be assigned a unit post-test or given a prescription for additional work in the unit. If a student exhibits mastery of the unit on the basis of his post-test performance, he is assigned to the next unit in which lack of mastery has been evidenced. If, however, he fails to demonstrate mastery on the post-test, his performance is carefully evaluated, and he is assigned a new prescription for those objectives within the unit that he has failed to master. It is through this process of continual re-evaluation that a student progresses from one learning task to another in a manner commensurate with his individual needs and ability.

Management Information System

Because of the quantity of information needed by a teacher to monitor the student's work, IPI operation requires that a number of teacher aides be employed to assist the teacher in routine classroom clerical tasks, management of the material inventory, and maintenance of student records. Experience indicates that approximately one teacher aide is required for every 100 students. Since one of the most time-consuming tasks performed by the teacher aide is the maintenance of student records, a study was started in 1967 to determine the feasibility of developing a computerized management information system. On the basis of this initial study, the Center has begun the development of a computer information system in the Oakleaf Elementary School.

The hardware configuration consists of an optical scanner and card punch, and a typewriter console with card reader located at the school; a typewriter console at the Learning Research and Development Center; and an IBM 360/50 computer at the University of Pittsburgh's Computer Center. Student information is generated at the school and transmitted via leased telephone line to the Computer Center where it is stored on disc and magnetic tape. This student information is up-dated on a daily basis to provide the teacher with daily status reports for each student or group of students.

This computerized information system permits teachers to query the system for particular student information in order to manage the instructional situation. Examples of the type of inquiries the teacher might make are as follows:

1. What students are working on a particular unit at a specific point in time?

2. How long has a student been working on a particular unit?

3. What prescriptions have been assigned other students working on the unit?

4. What relevant student background information is available for a given student?

Through the utilization of this information system, a teacher can receive, within a matter of minutes, information necessary for the effective management of his classroom. Students working at similar places in the curriculum can be quickly identified and brought together to discuss common problems. Information concerning student performance can be present in a concise format that can be readily utilized in the preparation of student prescriptions. In this manner, the teachers and their aides are relieved of a number of sundry functions that can be performed more effectively by the computer.

In summary, the Learning Research and Development Center has been engaged in designing an instructional system that would be responsive to the needs of the individual student. The IPI procedure that has resulted from this effort is one alternative that merits consideration for individualizing instruction. Through an iterative process of formative evaluation, the Center is continually studying and modifying the IPI system. The Center feels that it is only through such relatively long-term developmental work which includes provisions for the continual feedback of performance information for the improvement of the system that it will be possible to produce an instructional program that truly accommodates the individual student.

CHAPTER IV

PLANNING FOR INDIVIDUALIZED INSTRUCTION OF DEAF STUDENTS AT NTID

by

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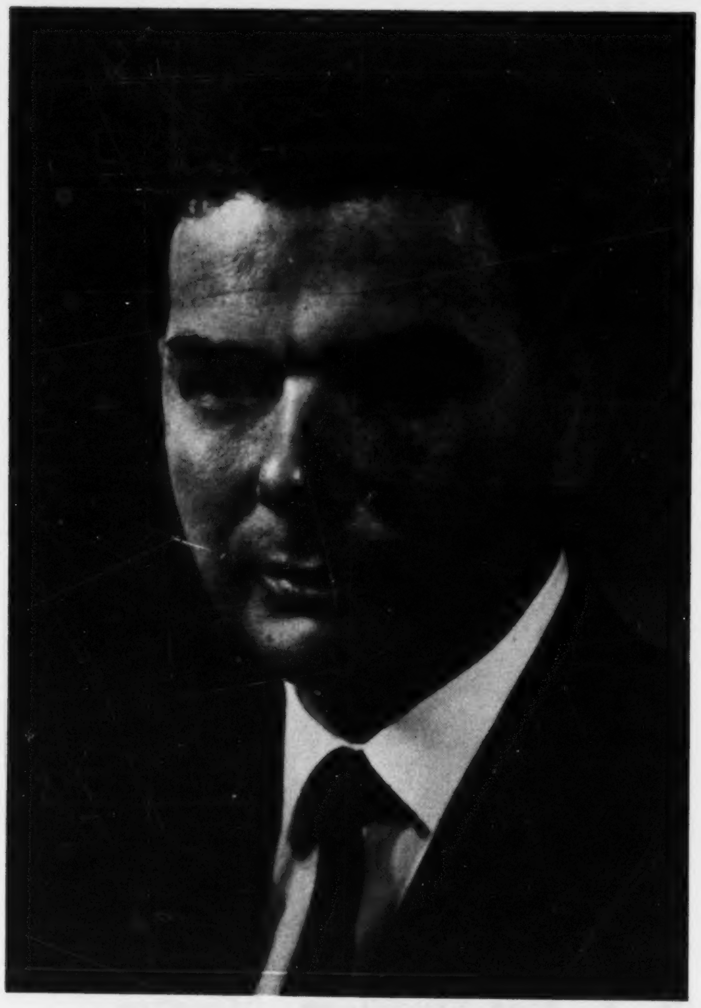

E. Ross Stuckless, Ph.D., is presently Professor and Director of Research and Training at the National Technical Institute for the Deaf in Rochester, New York. Dr. Stuckless received his B.A. in Psychology from the University of Toronto in 1956. In 1959 he obtained his M.S. in Special Education from Gallaudet College and in 1963 he earned the Ph.D. from the University of Pittsburgh.

His professional career began in 1956 as a teacher at the American School for the Deaf in Hartford. During the 1959-61 period he was a teacher and psychologist at the Western Pennsylvania School for the Deaf in Pittsburgh. From 1961 to 1967, he was a Research Assistant and Associate Professor at the University of Pittsburgh. He joined the staff at National Technical Institute for the Deaf in 1967.

Dr. Stuckless is a member of the American Psychological Association, the American Educational Research Association, the Convention of American Instructors of the Deaf, and the Council for Exceptional Children.

PLANNING FOR INDIVIDUALIZED INSTRUCTION
OF
DEAF STUDENTS AT NTID

A Hierarchy

One can interpret individualized instruction in a number of ways. We might take the position that what is represented by "education of the deaf" is by its nature individualized instruction since the underlying assumption is that there is or should be certain differences between the ways in which the hearing child and the deaf child are taught.

Within education of the deaf we recognize differences among deaf students. We attempt to keep classes as homogeneous as feasible. We set up two or more tracks for our older students. We attempt to set up an array of prevocational or vocational offerings as the case may be, in most of our residential schools.

We attempt to keep our classes as small as possible in order to permit the teacher to give as much specialized attention as possible to each student in her care. At the preschool level particularly, we may even be able to schedule teacher and child to meet for certain learning activities on a one to one basis. This clearly does, or should, represent individualized instruction.

There seems to be a hierarchy of individualized instruction, beginning with the grouping of students on the basis of general similarities in learning characteristics and other educational considerations, and culminating in individually prescribed instruction tailored for a specific student.

I have approached the topic, "Planning for Individualized Instruction of Deaf Students at NTID" with this hierarchy in mind, describing first the general program features which are salient to the topic, then describing some techniques in use or being explored specifically for groups of deaf students, and finally discussing our current procedures and efforts at individually prescribed instruction.

Program Organization and Individualized Instruction.

One of the distinguishing features of the National Technical Institute for the Deaf, as most of you know, is that it is organically related to the Rochester Institute of Technology. When the projected NTID enrollment is reached, 750 deaf students will be sharing the total resources of RIT with approximately 5,000 hearing students. An early task of NTID was, and continues to be, learning more about the parent Institute, in order to assure that deaf students can take full advantage of what RIT offers. A second task is to plan special support services for deaf students in preparing for employment.

A pilot group of 70 deaf students was admitted to RIT in September, 1968. This first year of the program represents a learning experience for the students, for RIT, and for those of us involved in developing services for deaf students through NTID. A cornerstone of the program is the concept of flexibility. Flexibility is a cornerstone in mounting any individualized instructional approach for deaf students, whatever the educational setting.

Organizationally, the NTID program is the responsibility of three divisions, the Division of Student Planning and Services, the Division of Instructional Affairs, and the Division of Research and Training.

While all three divisions are critical to the NTID program, the major task of instruction, as might be surmised, lies within the Division of Instructional Affairs.

The Division of Instructional Affairs consists of three major instructional programs. The first of these three is concerned with providing support services to deaf students in associate, baccalaureate, and masters level programs at RIT. Deaf students this year are enrolled in the Colleges of Applied Science, Business, Fine and Applied Arts, Graphic Arts and Photography, and Science, and in the College of General Studies. Accordingly, deaf students are majoring in such diverse fields as Electrical Engineering and Textiles. Seated in each of these Colleges is a person we call an NTID Educational Specialist. In each instance, this person has a background of training or experience related both to the programs of that College and to the education of deaf students. The Educational Specialist and his staff are charged with the general responsibility of assuring that the deaf students in his College have an optimum learning environment. At times he is academic counselor to the students, consultant to instructors, schedulor and coordinator of other services at his disposal.

A second program within the Division of Instructional Affairs is what we have called the Vestibule Program. This program follows from the awareness that relatively few deaf students, whether they have graduated from a school for the deaf or a regular high school, are truly ready to step immediately into advanced educational programs. Each deaf student comes to RIT with a different profile. From his educational background, academic and vocational interests and aptitudes, and other important considerations, there must be constructed a program which will prepare him for his subsequent studies at RIT and ultimate employment. This is obviously a highly individual matter, and demands a highly individualized program of studies for most deaf students.

The Vestibule Program is being developed directly under the auspices of NTID. This program is presently operating in modified form to serve deaf students already enrolled in degree programs. A typical deaf student may be taking one or more degree level courses, while at the same time receiving small group instruction in secondary level mathematics, science, or English. In September of this year, social studies will round out this core. It is unlikely that two students will take the identical program. It is evident, for example, that a preparatory mathematics program for the student who wishes to move into a program preparing him as a machinist should differ from the mathematics program another student needs in order to prepare him to enter a mechanical engineering program. Similarly, a girl intent on entering a medical technology program probably needs more preparation in chemistry at the Vestibule level than a girl who wishes to train in business equipment. Perhaps the latter girl needs no additional science preparation at all.

This brief description of the Vestibule Program serves to illustrate the need and plans for individualized instruction at this level. Such a program requires more than token flexibility.

The third instructional unit of NTID is the Diploma Program. Since diploma programs do not presently exist for full time students at RIT, NDIT has taken the initiative in planning several diploma offerings which are expected to become available to deaf students in September. More will be added. The Diploma Program will round out the instructional programs available to deaf students. As may be seen, this broad range of educational experiences available to students should permit NTID to serve deaf students with a broad distribution of educational backgrounds and career interests. It should also make it feasible to prescribe individual programs of study for each student admitted to the program, based upon the student's educational background, ability, and career goals.

Student-Centered Instructional Support.

Moving further up the hierarchy of individualized instruction, we find a number of specific techniques useful, indeed, essential, to the continuing academic progress of our deaf students.

One can think of good learning as a solid line between what is to be learned, the instructional content if you will, and the learner. Whether this is a solid or a broken line depends heavily on the way in which the information is communicated, whether it be through a book, an instructor, videotape, or another medium.

Since the instructor has a primary role in determining how the information is to be transmitted, it is vital that he wish to transmit to the deaf learner, and that he know how to do so. With this in mind, NTID initiated an intensive training program for RIT faculty prior to the admission of large numbers of deaf students in 1968. This training has been conducted in four phases. During 1967, members of the NTID staff were invited to speak to every department of the Institute. This served to inform, and to engender interest among the RIT faculty in teaching deaf students. During the summer of 1968, 45 faculty members participated in an intensive institute[1] designed to foster confidence and skill in teaching deaf students. This was followed by a brief workshop on NTID for all RIT faculty, about 250 in number. The fourth phase is a continuing one in which the NTID educational specialists and their staff meet regularly with RIT faculty, both within departmental meetings, and individually, to discuss the progress and problems of individual students. These contacts lead to increased sophistication on the part both of RIT faculty and NTID in tailoring programs to individual deaf student needs. An abbreviated two-week institute is currently being planned for other key RIT faculty this summer, as well as an extended eight-week institute for NTID staff members preparing to teach in the Vestibule program. We see the training of faculty as a necessary prerequisite for individualized instruction.

Tutoring is also an important aspect of a student-centered program. We have observed that RIT instructors encourage deaf students to meet with them on an individual or small group basis for special help. In addition, NTID offers a special tutoring service. This service is provided directly by NTID staff and also by RIT hearing upperclassmen under NTID supervision.

Manual and oral interpreters participate in most regular classes. Using the simultaneous method, the interpreter affords the deaf student the opportunity of selecting either or both communication systems.

Taking lecture notes also poses a problem for deaf students. A special notebook[2] has been designed to permit hearing notetakers to take notes for deaf peers in their classes conveniently. Over 200 RIT hearing students, all volunteers, are presently taking notes for deaf students.

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[1] A working paper describing and evaluating this program is available upon written request to Robert R. Gates, Coordinator of Training, NTID.

[2] A report describing the notebook, and a study of the process of notetaking for deaf students is available upon written request to the author.

While both interpreting and notetaking assist the deaf student in his courses, neither completely resolves the problem of in-class communication for most deaf students. We have selected a course in western civilization to study a procedure for audiotaping, transcribing, and editing into its written form each lecture. We are also compressing each transcribed lecture into a "telegraphic" version which preserves the content but reduces the language content. Both the edited version and the telegraphic version are placed in the hands of the deaf student within two days. During the present quarter, we are examining both the instructional value and the economics of this procedure in order to determine whether it is feasible to extend the procedure to other courses.[3]

The central objective of the faculty training program, tutoring, interpreting, special notetaking, and transcriptions and telegraphic versions of lectures, is to provide as many useful instructional services to the deaf student as possible. The reliance upon each of these services will vary from student to student.

While the services mentioned are presently in full or limited operation, several other techniques are presently under study. The medium of television holds considerable promise in tailoring instruction for the deaf student. A specially designed three-camera television system has been developed for NTID. This system will permit us to videotape lectures, adding an interpreter and captions through a split-screen technique. Some students may use their residual hearing and speechreading ability to attend directly to the instructor. Others may attend directly to the interpreter, and still others primarily to the captions. However, a number of problems remain. Will the presence of all those stimuli on the screen concurrently be distracting to students? Is the interpreter necessary if the captions are present? Can the entire lecture content be captioned? These and numerous other pertinent questions are under study. Results of these inquiries should lead to techniques which allow us to tailor the mode of presentation to the communication strengths of each student.

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[3] A report of this study will be available in September, 1969, upon written request to the author.

Dial-Access Television and Computer Assisted Instruction.

Considerable attention within the field of educational technology has been directed of late toward dial-access systems. Dial access places certain instructional sequences under student control. On a number of campuses, students can dial into a random-access audiotaped instructional presentation. Of more immediate relevance to deaf students, dial-access television equipment has now become available. It will likely become possible at some future date for students routinely to dial a lecture at their convenience. We are presently experimenting with such a system. Unfortunately, two major problems remain to be solved. The first is economic feasibility. The cost of purchasing and maintaining a system to serve large numbers of deaf students is presently very high. Second is a problem common to all educational technology, notably the limited availability of software. Dial-access television consumes programmed materials voraciously. We are planning initially to videotape brief summaries of lectures which students can dial into before the class meets, in order to obtain an orientation to the lecture. The future of dial-access television for individualized instruction of deaf students is indeed promising, but only when major obstacles are overcome.

Several mediated "learning packages" are currently under development. For example, a committee of RIT professors who had instructed deaf students in the various sciences during the fall, 1968 quarter, was assembled to attempt to isolate scientific "hangups" encountered by deaf students. An outgrowth of this committee is the development of a basic instructional unit dealing with the concept of relationships. This self-instructional unit will be field tested in the fall with those deaf students who have not mastered this fundamental scientific concept.

I have reserved discussion of computer-assisted instruction for deaf students until this time because in the heirarchy of individualized instruction, it probably holds a unique place. NTID installed an IBM-CAI system in June, 1968. We were, and continue to be excited about its future role in the education of deaf students.

We see CAI or, as we conceptualize it, computerized multi-media instruction, playing a major role in the instruction of deaf students, particularly within the Vestibule Program. Our major efforts to date lie in the area of secondary level mathematics. However, again we find an absence of software, instructional programs which lend themselves to our specific needs. Accordingly, it remains for us to develop most of our instructional materials.

During a six-week period last summer, we carefully analyzed the prerequisites for post-secondary level mathematics courses. Based on information garnered at that time, we are presently engaged in developing an extensive diagnostic - remedial mathematics program which when complete will support vestibule level students in preparing for different courses of study.

Applications extend, of course, beyond mathematics instruction. It has remarkable versatility in handling language as well as non-language content. However, it is constrained by the availability or development of instructional materials.

We take the position that CAI, while a powerful instructional tool should bear the same scrutiny as any other aspect of educational technology. There should be solid justification for its use. We view the NTID-CMI Center as serving in two ways, first, to provide a powerful diagnostic and instructional service, and second, to assess both the capabilities and limits of computer applications to learning.

Conclusion.

Rather than viewing plans for instruction at NTID dichotomously as either individualized or group-based, I prefer to think in terms of a student-centered hierarchy, beginning with an approach to program organization, extending through special instructional support for the deaf student, and culminating in a distillation reflected in computer-assisted instruction.

NTID's central effort is concentrated on extending the occupational horizons of young deaf people. The employer is a demanding judge. Deaf students are admitted to RIT with widely disparate characteristics. When they graduate, they will be seeking quite varied kinds of employment. They must, however, share at least one attribute; they must be well prepared. We must plan for individualized instruction.

CHAPTER V

MEDIATED SELF INSTRUCTION

by

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Paper prepared for Symposium on Research and Utilization of Educational Media for Teaching the Deaf, March 17-19, 1969, Lincoln, Nebraska.

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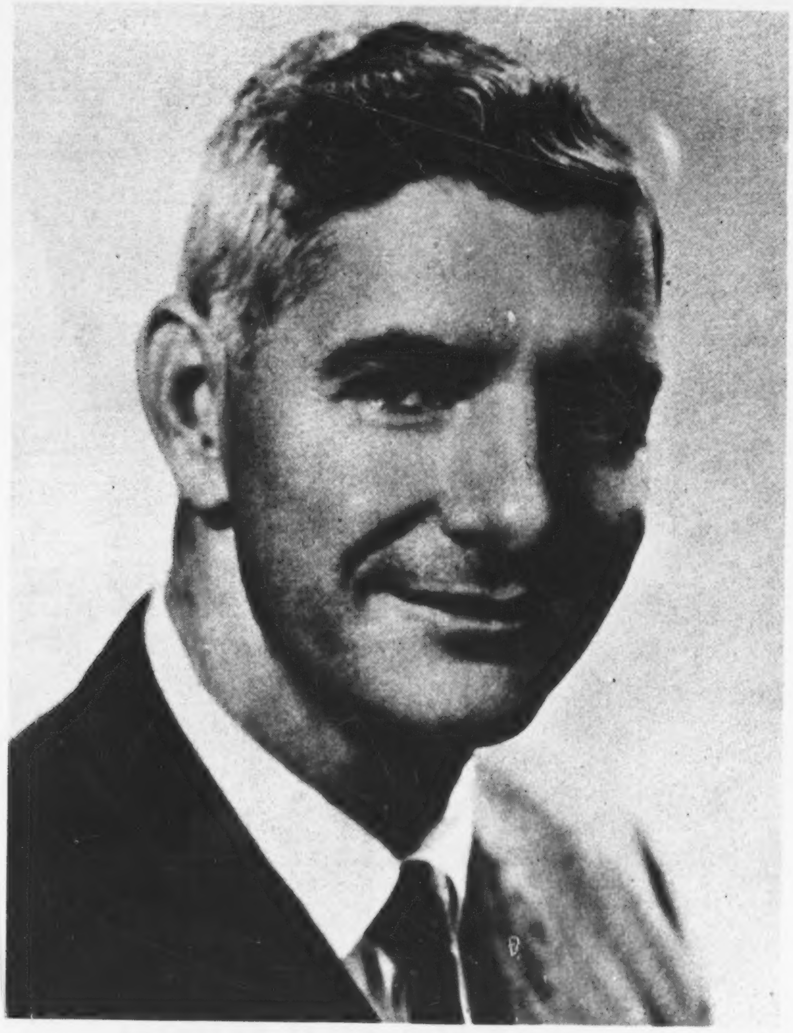

Dr. Samuel N. Postlethwait, Professor of Biology at Purdue University, received his Bachelors degree from Fairmont State College, his Masters from West Virginia and his Doctorate from Iowa. Dr. Postlethwait has taught in the public schools of West Virginia and at Iowa State University. He was a National Science Foundation Faculty Fellow at Manchester University. In 1965 Dr. Postlethwait was honored by Best Teacher Awards from both the Purdue Student Government and Sigma Delta Chi.

Dr. Postlethwait has authored three textbooks and published innumerable articles in professional journals. In 1968 he was honored with a Fullbright Fellowship in Australia for four months. Much of his work has been devoted to investigating the audio-tutorial and multi-faceted methods of teaching Botany to college students. During the 1964 and 1965 years he was invited to participate in more than thirty meetings, workshops, and conferences at which he demonstrated and explained this new approach. Besides these many engagements and his teaching duties, Dr. Postlethwait has served on several committees including: The Committee on Undergraduate Education in the Biological Sciences Panel on Laboratory Innovation; Representative of the Botanical Society of America to the American Association for the Advancement of Science Cooperative Committee for the Teaching of Mathematics and Science; and the Botanical Society Committee on Education.

MEDIATED SELF INSTRUCTION

Why Use Media In Instructional Programs?

High cost of education, swelling enrollments, the "in thing" and similar factors have caused many educators to adopt the use of media. The fact that media can do a great deal to alleviate some problems in education is not the primary purpose for using media. Unfortunately, many of us become enamored with certain special equipment and lose sight of the primary purpose of teaching activities which is "to help students learn". If one can focus on "helping students learn" as the single most important guideline, a great many of our problems begin to resolve themselves. Some of the "sacred cows" such as scheduling procedures, use of specific media, etc. can be relegated to the role of a tool to accomplish the goal rather than a component of the system which dictates how the job is to be done.

If one asks oneself "what kind of course would I structure if I had only one student?"; it seems unlikely that the answer would be: a lecture on Monday, Wednesday and Friday, a lab on Wednesday afternoon and a recitation on Friday afternoon. Much more likely the one student and the instructor would arrange a convenient time to meet, the instructor would assemble those items which he hoped would help the student understand the subject and the two would sit among those items while the instructor tutored the student through a sequence of learning activities. This truly would be individualized instruction. Immediately one recognizes that this idealized arrangement is impractical in todays schools for several reasons including the availability of capable instructors. However, one also recognizes that, even though one has a thousand students, each student is an individual; and that if "one tutor one student" is best, then we should try to provide this idealized situation for all students. While it is impractical on a literal basis, it is possible to simulate this arrangement through the use of appropriate media. An excellent instructor can be recorded as he sits among the appropriate materials and tutors a student through a sequence of learning activities. The product can be duplicated as many times as necessary to accommodate any number of students. Besides extending the impact of an excellent teacher to a great number of students, many bonus features result which will be discussed later in this paper. If one accepts this as a basic guideline to individualized instruction, it is clear that new scheduling procedures, new types of class sessions, and a total restructuring of the approach to education may be necessary.

The Audio-Tutorial System--A Case in Point

In 1961 the author became so distressed with the diversity of backgrounds, interests and capacities of students in an introductory botany course that he initiated a program of supplementary taped lectures to be used as an option to the conventional presentation. Since it was his first experience in teaching one student at a time, the first tapes were merely lectures attempting to transfer information. However, as the effort progressed, materials such as a textbook, lab manual, specimens and experimental equipment were added to supplement the taped lecture. Eventually, preparation of the special lectures involved the assembly of all items considered useful in learning the subject, and then the author would sit among these materials and talk into the tape recorder as if he were talking to one student, tutoring that student through a sequence of learning activities. Programs prepared in this way were so well received that the author was encouraged to investigate the potential of this procedure for a large group of students. A great deal of evolution has occurred since 1961, and perhaps greater changes are yet to come. Currently, the restructured program involves three study sessions per week:

(1) an Independent Study Session (ISS),
(2) a General Assembly Session (GAS),
(3) an Integrated Quiz Session (IQS), and
(4) other appropriate activites.

Independent Study Session (ISS):--The Independent Study Session is the central feature of the Audio-Tutorial System. The student comes to a Learning Center (open from 7:30 a.m. until 10:30 p.m. Monday through Friday) at his convenience and checks into one of 32 booths. Each booth is equipped with a tape player and other appropriate materials for the week's study. The student begins his study by placing the earphones in position and arranging the materials for quick reference. The voice of the senior instructor tutors the students through a series of learning activities. These may include viewing a film, reading from the text, doing an experiment, listening to a brief lecture or any other kind of activity which will enable the student to achieve the appropriate objectives. Each student, as he enters the Learning Center, picks up a list of behavioral objectives covering the week's work.

It is expected that the student will refer to these behavioral objectives during the course of his study and use them to measure his level of achievement. All students proceed independently and at their own pace. No student is a captive audience or required to spend any specified amount of time in the study. Each student studies until he is satisfied that he has accomplished the course objectives. An instructor is available within the Learning Center at all times to give assistance to those students who are not able to achieve the goals without special help.

General Assembly Session (GAS):--The General Assembly Session is scheduled weekly and, on some occasions, involves all students in the course. It provides an opportunity to show long films, to present guest lecturers, give general orientation and other kinds of activities that can best be done in a large group. Students are only required to attend those General Assemblies which include subject matter not covered in the Independent Study Session. Some of the General Assemblies are used for help sessions and testing periods. It should be made clear that this session is not "the lectures" in the course. Neither is the Independent Study Session "the laboratory" in the course. The idea of dividing the course into a lecture and laboratory destroys the very basis on which the whole program is developed.

Integrated Quiz Session (IQS):--The Integrated quiz is an attempt to exploit the principle that "the first time one really learns a subject is when one teaches it." If this is indeed a principle, then one should include in a program of instruction an opportunity for students to "teach". The way one tests dictates the way a student will prepare. It is the purpose of this session to force each student to prepare as if he were planning to teach about each item or idea included in the course. The session involves eight students and an instructor seated around a table in an informal arrangement. It meets on a weekly basis, and there is available to the instructor the various items which have been included in the Learning Center the preceding week. These are the items that have been used in helping the student accomplish the stated behavioral objectives. The format of the session is a very rigid one. The items are delivered to the students in the same sequence as they were organized in the Independent Study Session. The student to respond is selected at random to assure that all students must prepare for all items. The items may be a piece of experimental apparatus, a specimen, a chart, diagram, graph or even a portion of a textbook or manual. The format for the student's presentation is:

(1) identification of the item,
(2) relate the item to its appropriate objective,
(3) "teach" about it.

Each student has at least one turn during the one-half hour session. At the conclusion of the student's presentation, the instructor places him in one of three categories--excellent, 9 points; mediocre, 7; poor, 5 points or less, and the other students are given an opportunity to make corrections or additions to the presentation. Grades may be raised at the end of the session if the instructor feels it is appropriate. It should be emphasized again that the main purpose of this session is not to determine grades but to influence the student's method of study.

The oral quiz has many bonus features besides its effect on students. It enables the instructor to learn the effectiveness of the study programs in a very direct way, and it provides valuable clues as to how one can improve the presentation of subject matter. All students become well known by an instructor, and all students know an instructor well despite the large enrollment (600 students). A close personal relationship can be achieved that serves as a strong motivating factor for both student and teacher.

Other Activities:--In addition to the three somewhat formal sessions, there are other activities which are important to the proper implementation of a study program. Some of these include the incorporation of long-range inquiry type experiments, and in the specific course in question there are two such experiments. The first one is done by all students and is initiated at the first meeting of the small group of students. It is a miniature research project in which the students participate in defining of the problem, designing the experiment, doing the experiment, analyzing the data, and writing up the study in the format of a paper for the American Journal of Botany. The second project is done by only those students who anticipate making an "A" in the course. This project, too, must be written in the style of a research paper. Some other activities include a weekly coffee hour by the senior professor, an open house at his home once each semester, and a great many small items included in the Learning Center which are designed to create a proper environment for study and promote intellectual exchange through discussions and impromptu seminars.

Results

The results have been highly gratifying and stimulating from every point of view. The students are enthusiastic; and in many cases, have encouraged other instructors to embark on a similar program. Grades have improved so that many colleagues are pleased with the amount of progress. The level of staff and general costs are somewhat less than under the conventional system. The system breaks the lock-step approach of the conventional system so that students can pace themselves. However, after eight years of revision and modification, it is clear that the potential of the system still has not been totally exploited. The use of grades encourages students to look for the "get by" amount of learning rather than total mastery of subject matter. This image of education conditions students to habits that frustrate excellence. It is almost paradoxical that our conventional education system has long reinforced a "percentage of mastery" as a way of life. With a few modifications, the Audio-Tutorial System can eliminate this approach entirely. A change in strategy, using conceptual units rather than weekly time intervals as the basis for structuring self-instructional programs could provide self pacing on a long-range basis as well as the short-range basis. Many other important educational advantages can be achieved if we use boldness in restructuring the program and clearly define the problems involved.

Individualization--Some Critical Points

Most of us seldom, if ever, have tutored one individual through the entire gamut of subject matter in a given course. The strategy of individual instruction is considerably different from that of group instruction. No longer does one work on a percentage basis, but one anticipates full and complete mastery by each student. There is a real difference between group instruction and individual instruction in the tone of voice and the expressions one uses. An audio tape produced in the image of "one instructor talking with one student" does not include phrases such as "when all of you have finished with . . ." or "most of you . . . ." One-to-one instruction involves considerably less redundancy than that used in group instruction. Many of us as lecturers have picked up the habit of expressing ourselves with a great many words and in many different ways. This habit is especially frustrating and boring to the student listening to a tape. The quality of voice is different. It is not "lecturish" as if one were talking to 100 students. The insertion of many questions is a great help in capturing the student's attention and imagination.

When one uses the audio tape as a means of programming a sequence of learning activities, it is axiomatic that the student must be involved at all times. This often is best accomplished with visuals such as pictures, models and specimens which the student is asked to view coincident with listening to the instructor's discussion. A very simple but subtle and important procedure for commanding the student's attention is to begin by having the student locate or hold in hand the particular visual related to the audio discussion. For example, a simple presentation such as one might make concerning a list of coming activities can be approached in one of two ways:

(1) one can begin by discussing the purpose of the list and give him some background information concerning it, then ask him to pick up the list; or

(2) one can begin by asking the student to pick up the list

and, while his attention is focused on the list itself, explain the purpose and give background information.

This mere inversion of timing in directing the student's attention to the list can make the margin of difference in the success of the program for many students. This point may seem trivial, but it is important to ask the student to have in hand some item as the initial event of a learning activity. Also, it is necessary that the materials be so structured that the item being discussed is clearly identified. A page full of math symbols may be easy for the instructor to follow, but a student must have identified for him line by line the point under consideration if the program is to be helpful for him.

Probably the most critical point for utilization of media in individualizing instruction is the use of imagination. For many years the image of the teacher has been "a means for the transfer of information". In many cases, media have been used as just another vehicle to accomplish this end. This is an unfortunate approach, for media provides us an opportunity to introduce students to new ideas in a new and exciting way. A case in point is a very clever utilization of abnormal and disease specimens as a means of teaching normal human anatomy (medical school at Michigan State University). We accept a rather stereotype approach to the transfer of information. Learning outside the formal classroom does not follow the conventional pattern at all. Most commonly, a phenomenon or situation occurs and the learner investigates it. Perhaps many of us are too academic and fail to use commonplace experience as a background for developing an instructional program. In any event, this aspect of our teaching methodology could stand some thorough investigation.

In the final analysis, the success of any system is determined by whether students achieve through its use. Media enables us to structure a program which can be carefully evaluated and revised. The components of a sequence can be reorganized or replaced and the effect on learning determined. This is in contrast with the conventional presentation of lectures which are so highly variable that no determination can be made of the effectiveness of the individual ingredients. Media provide a potential for flexibility and individualization well beyond the wisdom of many of us. The challenge is to approach the use of these tools creatively and with real imagination.

CHAPTER VI

COMPUTER-ASSISTED INSTRUCTION
AND
ITS POTENTIAL FOR TEACHING DEAF STUDENTS

by

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Mr. Rathe obtained a B.S. degree in economics from Loyola University in 1942 and later did graduate work at the Loyola Law School and Northwestern University. During World War II, he served as Lieutenant Commander, U.S. Naval Reserve.

Joining IBM in mid-1948 as a salesman in New Orleans, he was promoted to branch manager in Oklahoma City in 1954; to DP district manager in Cincinnati in 1957; and in 1958 to sales manager for the Federal Systems Division.

In November 1961, he was promoted to Corporate Staff as director of executive development and in November, 1963 was promoted to IBM director of education. He assumed his present position as director of education for the Data Processing Division in November of 1965.

Mr. Rathe is Past President of the Board of Trustees of the Whitby School in Greenwich, Connecticut and is a member of the Board of Directors of the Brunswick School in Greenwich. Mr. Rathe is a member of the Advisory Board of the National Technical Institute for the Deaf at Rochester Institute of Technology and recently joined the National Advisory Board of Social Rehabilitation Services, U.S. Department of Health, Education and Welfare. In November of 1968, Mr. Rathe was elected a member of the Board of Directors of Gallaudet College in Washington, D. C.

COMPUTER-ASSISTED INSTRUCTION
AND
ITS POTENTIAL FOR TEACHING DEAF STUDENTS

My recent experience in computer-assisted instruction has taught me the value of establishing a short "glossary of terms." The less experienced member gets introduced to the subject matter significantly easier and at no appreciable cost to the more knowledgeable member of the group. The following glossary has been proposed by Ralph Grubb, Education Research Administrator, IBM Education Research Department, San Jose, California.

Glossary	A list of terms in a special subject, field, or area of usage, with accompanying definitions.
Technology	Technology means the systematic application of scientific or other organized knowledge to practical tasks.
Educational Technology	Educational technology is the application of technology to education.
Instructional Technology	Instructional technology is the use of technology to improve the student's interaction with his materials, subject matter and teachers.

Computer-Assisted Instruction	CAI is the use of a computer to improve the student's interaction with his materials, subject matter and teachers.

Eleven ways in which the student interacts with the machine in a CAI system are: drill, practice, problem review, diagnosis and preparation, tutorial, gaming, simulation, fact finding, computation, logical problem solving and exploration.

With this vocabulary as background, I will outline what a CAI system is and what it does with special reference to the applicability to the deaf student. I will then conclude with a survey of some significant experiments presently being undertaken in CAI, including two instances of work with deaf students. To provide the general description of CAI and its relevance to the deaf, I am attaching an article written for the VOLTA REVIEW in September 1968, "Computer-Assisted Instruction--Promising New Tool for Teaching Deaf Students." I suggest that you read this brief article before proceeding to the next part of this paper which describes some significant work being conducted in CAI.

Industrial Education

There are two projects in the IBM Company worth mentioning. One is the training of computer servicement. These men are located in 200 different cities. The subject matter changes rapidly in 35 different courses. There are varying levels of aptitude and familiarity with the subject matter. The economics of this program look good because of the elimination of travel and living expenses in bringing men into centrally-located classrooms.

A more interesting project is the learner controlled course in Statistics offered to systems engineering trainees. The problem here was providing highly individualized instruction to new employees in simple statistics where the students' background varies from Ph.D. degrees in statistics to no college math credit at all. The conventional approach was to mix all students in a lecture hall and move at an average pace through the subject, boring the advanced students and losing the slowest ones. The experiment with CAI shows a promising approach in letting the computer help the student plan his own route and pace through the subject matter. The results show that students under a "learner controlled" plan learn more and faster than those under a preconceived curriculum.

General Education

The field of mathematics lends itself readily to experimentation in CAI since nearly all of the basic information is quantitative and hence can be handled readily by a computer. Also, the computer format seems to provide additional motivation for the student who normally is reluctant to experiment with math in a closely monitored classroom situation. Again, drawing on personal experience, the IBM education research group in San Jose, California, has been working with a public elementary school adjacent to the laboratory. Here, youngsters ranging in age from 5-8 come to the laboratory classroom several times a week for their lessons in arithmetic.

The key features of this experiment which I call to your attention are the use of a graphic terminal in lieu of typewriter terminal for student interaction with the computer. Typewriter input and output is also available. This introduces the possibility of using geometric patterns and objects to illustrate arithmetic manipulation instead of being restricted exclusively to digital information. A second feature of this particular project uses the students to generate the statement of the problem rather than having the problem generated within the machine and presented to the student. For example, the graphic terminal asks the student to propose two numbers which he will be asked to add together. This personal involvement, although seemingly minor, helps the learning process.

This second example of a notable application of computers to education is being undertaken by Cornell University School of Medicine. I cite this example to show that the subject matter need not be highly quantitative such as arithmetic. There are some very practical portions of many subjects which lend themselves well to a CAI mode. Two faculty members of the Medical School have been offering a course in anatomy. The cathod ray tube display is used to depict detailed drawings. For example, skeletal features, the rib cage, the skull, etc. The student is asked to identify certain portions of the anatomy as descriptions or functions of these parts are described to him. A light pen is used by the student to point to those areas of the drawing representative of his answer.

Education of the Deaf

There are three notable projects underway in this area. One is at NTID Rochester Institute of Technology; the second is at Gallaudet College, Kendall School and the third is a newly established center for education of the handicapped at Columbia University.

NTID, as a part of its official mission, operates a research activity. This function is under the general management of Dr. Ross Stuckless who is appearing on this program. This research group has a CAI classroom fully equipped with graphic and typewriter terminals. Courses are under development for use by the deaf students. Here is the concept of highly individualized instruction adapting to a wide range of abilities of deaf students. Courses under development range from those which supplement the regular courses of instruction at RIT to those "stand alone" classes especially for the deaf student. The students' needs may vary from drill and practice for reinforcing materials presented in a recent lecture to the remedial education courses taught exclusively at NTID as a part of the so-called "vestibule" program. (Color slides depicting the facilities and function of the NTID classroom will be displayed at the meeting.)

Another important development in CAI for the deaf is underway at Gallaudet College. I will not describe this in any detail since the next speaker will cover this subject in depth. However, it is important to note that Gallaudet has in operation a CAI classroom in mathematics for a large number of students at the Kendall School.

The final project I want to mention is the newly established Center for the Education of the Handicapped at Teachers College, Columbia University. This center will undertake research, demonstrations and implementation of educational programs for the physically and mentally handicapped including education of the deaf. The U.S. Office of Education is sponsoring the project and the plans include a computer CAI classroom for use of a variety of handicapped persons.

Conclusions

The use of the computer in education is still in the research, development and experimental stages although significant productive teaching and learning is being accomplished. General education has adopted this tool much more slowly than was anticipated. I believe this can be attributed to two causes--(1) lack of economic feasibility has deterred industry from pushing the technological developments rapidly and (2) the manifold difficulties involved

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in getting large numbers of teachers to prepare courses in computer languages. It is not surprising, therefore, that special education programs are beginning to use CAI at an increasing rate since the urgent need offsets these deterrants. These special projects not only include education of the handicapped but also some specialized areas of industrial and governmental training where needs are great and teaching resources few. Where general education has been slow and reluctant in moving ahead, I believe that special education will find additional motivation and cost justification to continue and accelerate CAI efforts.

Hopefully, the equipment manufacturers and developers can find ways to expand the quantity and quality of hardware and software needed to foster the growth of CAI. My hope is that the next several years will see sufficient benefits from the experimental work underway to generate more and better computer systems thus permitting large scale implementation. At the present moment it is too early to predict when this might happen.

The following article was written for the September issue of the Volta Review and is submitted as a discussion paper for the 1969 Symposium with the permission of the Volta Review. Mr. Rathe's article is most appropriate and relevant to our conference and we appreciate the willingness of the Volta Review to let us use it for this purpose.

Computer-Assisted Instruction
Exciting New Tool for Teaching the Deaf

by

G. H. Rathe, Jr.

The door opened and a group of youngsters trooped into the room. In a minute each child had settled before a computer terminal consisting of a typewriter and a television-like cathode ray screen. A message flashed on the tube: "Good morning. What is your name?" The children turned to the typewriter and, using the time-honored hunt-and-peck system, responded. The roll taken, lessons were ready to begin.

As I strolled around this novel classroom, I was struck by the fact that no two lessons flashing on and off the screens were at exactly the same point. The computer to which the terminals were connected had picked up where each pupil left off the lesson before, and was now proceeding at individualized paces. On one screen, a picture of a boy climbing a tree was displayed with the request that the student underline, with a light pen, the sentence of four shown that best suited the picture. At another terminal a girl was carrying on a "dialogue" with the computer by pecking out on the typewriter answers to questions that appeared on the screen. And at still another station, a boy was using his light pen to match words with picture images.

The above scene was part of an experimental computer-assisted instruction (CAI) English course conducted at an elementary school in California. The youngsters in this case were third graders with no hearing disabilities. But the participants in the class could just as well have been deaf students; and if they were, the description of the scene would have been exactly the same.

Computer-assisted instruction has extraordinary potential for deaf students. Perhaps the primary advantage of CAI in teaching the deaf is that it does not discriminate between the deaf and the non-deaf. As a result, it offers the potential for deaf students to attend regular schools along with youngsters who possess normal hearing; it eliminates the need for special training on the part of teachers who will work with these students; and it opens up the utilization of a greater number of teachers and teaching approaches to bring deaf students up to the level of others in their age groups.

This may seem like a large order for a technique that admittedly offers more promise than delivered goods at the present stage of development. Nevertheless, some basic understanding of CAI--what it is, how it works, what it has accomplished to date--should demonstrate why those concerned with the education of the deaf regard it as an important new teaching tool.

CAI, it is important to note, should not be confused with programmed-instruction courses or texts, or with conventional teaching machines. These methods, although they have shown some promising results in various areas of the educational process, have certain limitations. It is difficult and expensive to revise or reformat a programmed text, for example; and its branching capabilities--the mechanics for referring the student to different parts of the program based on his responses to questions, is also somewhat limited. Furthermore, difficulty is often experienced in analyzing student work and progress for the purpose of improving course material and offering proper guidance.

Although computer-assisted instruction bears some resemblance to programmed instruction, one feature sets it apart in a significant manner: CAI individualizes--rather than merely "personalizes" -- instruction. This means that course material can be presented to the student in response to his individual progress rather than in an inflexible, predetermined sequence. This ability to dynamically adjust the presentation of material is attributable to both the "hardware" (equipment) and "software" (programming) of the system.

The equipment connected with a CAI system consists of all of the various electronic units needed to store, control, act on, and present course material to the students. Essentially, this encompasses the computer's central processor; magnetic disk storage units used to maintain course materials, student data, and the various programs needed to operate the system; and the typewriters and cathode ray screens which make up the student stations.

The central processor is, in effect, the intermediary between the student and the materials contained on magnetic disk. One of its functions is to handle the flow of information to and from the various stations in such a way that to each student it seems as if he alone is using the computer. This technique is called "time-sharing." In reality, the computer may be sending information to or receiving information from a number of stations at approximately the same time. Through its tremendous speed and flexibility the computer interleaves these messages and instructions so that there is never more than a fraction of a second delay in answering a given station.

Magnetic disk storage units also play an important role in a CAI system by allowing the computer to sort, retrieve or update information on packs made up of several disks in a split second. This feature saves valuable time, which is so essential to the time-sharing concept.

Until recently, the most familiar units for entering or retrieving information from computer files were computer-controlled typewriters. Now cathode ray tube display units have been added to the student stations--with outstanding results. The screens, in effect, allow the CAI system to present complete segments of course material instantly, adding important speed and flexibility to the presentation and sequencing of material. The associated "light pens" broaden the ability of the student to communicate with the computer. When the light pen, used as a probe, touches a particular spot on the cathode ray tube, the computer senses the coordinates of the information at that location and acts upon the data.

The decision to rent or purchase a system for CAI is usually made at a high level in an educational system and is relatively inflexible as far as what units are needed and how they will be physically arranged. Few teachers are actually concerned with equipment, but they will want some ability to prepare or change material for computer presentation. This is where programming (or software) comes into the picture--and it is not nearly as awesome or complex as it sounds.

CAI systems basically employ two levels of programming: the Operating System--or the programs used by the computer itself; and the programs which, in effect, represent the various courses being taught on the machines.

The programs that make the computer work--the Operating System--are perhaps the most crucial to the overall effectiveness of the system. They should not only provide the computer with a means of interleaving the data going to and from the various terminals, but they should also include some highly simplified programming language which educators can use to prepare course material. For these reasons, development of an Operating System should not be left to the educational institution--unless it has the funds and the skilled manpower to accomplish such a job. Instead, the Operating System should be supplied by the manufacturer as part of the CAI package. In this way, the teachers who use the system need concern themselves only with course material, not with the details of setting up the computer to do the job.

A typical Operating System contains a variety of programs and routines which the educator can call on, as is, to perform a variety of jobs. The most important program in the package is a simplified programming language which he uses to prepare course materials. In the IBM 1401/1460 or 1440 Operating Systems, for example, this language is called Coursewriter. This language allows the educator to prepare course material with almost the same degree of flexibility he has under a non-automated classroom environment and without extensive training in computer programming.

Coursewriter consists of a vocabulary of words very close to the teacher's normal working idiom. By using these words, he can instruct the computer to present various sequences of questions, statements, and instructions; he can program data to challenge the brilliant student and enter special data for the slow student; he can stay within the familiar confines of programmed instruction, or he can move off into experimental educational areas; and he can even try his hand at simulation and gaming. Any teaching approach, in fact, can be communicated quickly and easily to the data processing system through the simple expedient of entering the proper Coursewriter statements through a typewriter keyboard.

It must be stressed that it is not the computer or any other piece of equipment that does the teaching, but the programs prepared by the educators. Therefore, the degree of sophistication of a given CAI course is dependent on the ability of the teacher to prepare an ample program and his desire to use the computer as a tool.

Ideally, there are three levels of interaction possible between student and computer. The first, and probably the most elementary level might be called the drill-and-practice system. This kind of interaction supplements rather than replaces the regular teaching process. After the teacher introduces new concepts and ideas in standard fashion, the computer system is used to review and practice these basic skills and concepts. Aside from relieving the teacher of this tedious job--time which she can use for more creative work--the drill-and-practice system allows exercises to be presented to the students on an individualized basis. Thus, the brighter students may move ahead with harder-than-average problems, while the slow learners are aided by the repetition of concepts and easy problems.

The second level of interaction is the tutorial system. Here the computer system takes over the primary responsibility for teaching the students concepts and skills, under the program developed by the educator. The advantage of the tutorial system is that the teacher can concentrate almost exclusively on more adroit ways of teaching, while the computer acts as a patient tutor, presenting new course material only when the student has indicated a grasp of the old.

Finally, there is the use of CAI as a dialogue system. These are computer programs that enable the student to carry on a genuine dialogue with the computer through the medium of typewriter keyboard, light pen, and cathode ray screen. One example is a simulated environment project which was prepared recently to test the feasibility of teaching the subject of qualitative analysis with a computer.

Qualitative analysis is one of the methods used to identify and separate elements in a chemical compound. Noramlly, it is done in a "wet lab" with tools such as test tubes and reagents. In the study, however, all interaction was through a computer. The student was shown a colored slide of a test tube and asked to identify the elements. As a starter, he typed the name of the reagent he wished to use, and what operations he wanted performed on the solution. The computer evaluated the input and displayed the results. The student then asked for a new series of tests, until he arrived at a satisfactory conclusion.

It is important to note that the experiment was not designed to replace conventional lab procedures, but simply to provide a setting where students can experience--albeit vicariously--what happens in a lab. At the same time the course was conducted without the time, expense, and hazards normally present.

Another important CAI dialogue experiment is the gaming approach. Using Coursewriter to prepare his program, the educator can set up in the computer a model of an ancient civilization, giving the student the role of priest-king. The computer then changes factors in the environment, indicating these changes to the student through his typewriter terminal or cathode ray tube screen. To meet these new conditions, the student types certain decisions--how much grain to set aside, for example. The computer then computes the effect and displays a new food-supply position. And the student is forced to make another decision.

Obviously, such a game is an extremely imaginative way of imparting social and economic principles. As in all forms of computer-assisted instruction, the program written by the educator is the key element of the system.

In the education of deaf students, of course, there are some special problems that must be taken into consideration. In a drill-and-practice system, for instance, CAI would be of little value to the deaf unless the basic knowledge is taught appropriately to non-hearing students.

Beyond drill-and-practice, CAI offers some dramatic possibilities for these children. Both tutorial and dialogue systems circumvent the oral communication problem by bringing virtually all knowledge to the students in the form of either visual display on the tube or typewritten messages on the typewriter. Thus a deaf student taking his place in a regular class--provided that class were using CAI techniques--could probably do very well.

Moreover, the ability of the system to present course material in pace with the student's individual progress will relieve deaf students of many extra burdens.

In summary, CAI is neither a panacea nor a teacher substitute. It is only a new tool in the long list of tools available to teachers. For both deaf students with remembered and unremembered speech, it may represent a major breakthrough. And as CAI becomes more commonplace as a teaching tool, the programs developed by educators will be applicable to all students--the deaf and the non-deaf--through the media of terminals such as typewriters and display units.

CHAPTER VII

MATHEMATICS CURRICULUM SUPPORTED BY COMPUTER ASSISTED INSTRUCTION

by

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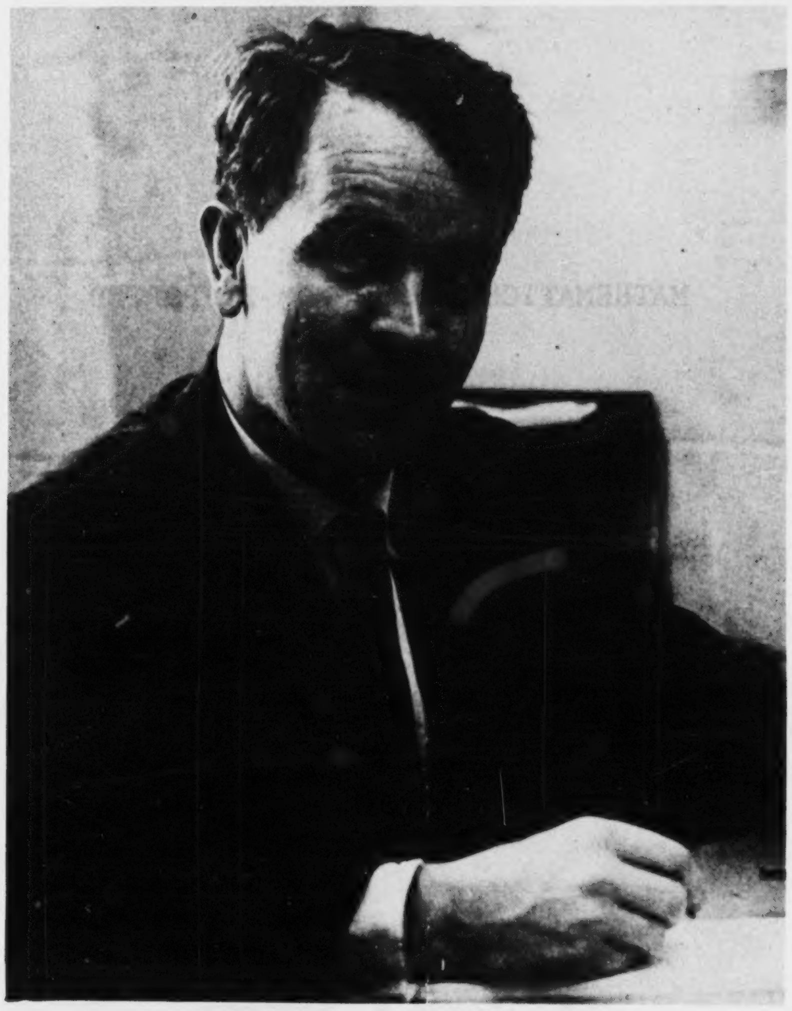

Thomas R. Behrens, Ph.D. Director of the Kendall School for the Deaf at Gallaudet College, Washington, D. C. received much of his basic education in Switzerland. Dr. Behrens obtained his Elementary and Secondary Diploma and Special Education Certificate at the University of Zurich. His Ph.D. in Language Pathology and Psychology of Deafness is from Northwestern University, Evanston, Illinois.

Mr. Leland Clack originally taught Mathematics at Fulton County High School in Hickman, Kentucky. In 1963, retaining his same teaching title, Mr. Clack moved to the Maryland School for the Deaf in Frederick. Mr. Clack continued his math teaching career at Middleton High School also in Frederick during the 1966-67 year. He is now Coordinator of Mathematics at Kendally School for the Deaf, Gallaudet College, Washington, D. C.

Mrs. Linda Alprin is currently the Supervisor of Programmed Instruction at Kendall School for the Deaf, Gallaudet College, Washington, D. C. Mrs. Alprin has a B. S. degree in Speech with a minor in Psychology. Her M.A. degree in Speech was obtained in 1966 from Northwestern University, Evanston, Illinois.

MATHEMATICS CURRICULUM SUPPORTED
BY
COMPUTER ASSISTED INSTRUCTION*

Introduction

It is not the intent of this paper to demonstrate significant advantages or disadvantages of Computer Assisted Instruction in mathematics. Our program is too recent to make any objective judgements in this regard.

In this interim report we want to present the reasons which led us to this project. Mr. Clack, Curriculum Coordinator for Math, will briefly outline the CAI program and the way it relates to Kendall School math curriculum. Mrs. Alprin, Director of Programmed Instruction, will give you a brief account of the daily activities and her observations on the CAI project. She will also compare the student's attitudes toward CAI and other types of programmed instruction presently used at Kendall.

I think there is general agreement that in education (and particularly in special education) there is a tremendous need for didactic experimentation. It is easy to set up educational goals, but our major problem is to discover better ways by which a student can achieve these goals. In the case of a deaf student, this problem becomes even more difficult because he not only progresses academically at a slower rate, he also needs more repetition and therefore is apt to be more easily discouraged.

Kendall School's search for new ways became imperative when we looked at our unusually difficult population. The variety of educational backgrounds,

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* The Computer Assisted Instruction Pilot Project at Kendall is sponsored by a grant from the United States Office of Education, Department of Health, Education and Welfare.

(that is, children with and without preschool experience) the different types of abilities among our children, together with their different needs and interests made appropriate classroom grouping a nearly imposible job. Even reducing the number of children per classroom to six did not result in a homogenous group to which a sound curriculum in the major school subjects could be taught successfully. With ideas gained from previous symposia here at the University of Nebraska, Kendall School committed itself to the extensive use of new educational media. The impact of the multi-media classroom upon the children was highly beneficial. However, its use has still not eliminated the problem of a wide heterogeneity among the students. Furthermore, we realize the need for a curriculum in each major area, one which was geared to meet the individual child's needs and interests rather than merely providing a curriculum in language, mathematics, social studies and home economics.

Analyzing the various problems, we decided that the first step was to experiment with didactic approaches whereby learning could be facilitated by reinforcements meeting each individual child's needs. Once this was determined, the curricula could be constructed along the lines discovered in step one.

Two years ago we started with programmed instruction. We used a reading program which was specially developed for slow learning children, the Captioned Film program for lipreading and Project LIFE. We also tried out many other commercially available programs in mathematics and other subjects. The children were scheduled to work on these programs 10-20 minutes per day. The more programs and machines we had, the more children were scheduled. There were days when over 50 students per day utilized the programmed instruction section.

The results can be summarized as follows:

Positive Aspects:

1. The children responded immediately and well to the programs. Perhaps it was partly because they were able to get out of the classroom or because they were fascinated with the idea of handling a machine, but in any case, the motivation to learn was extremely high.
2. The teachers noticed significant improvement when the child performed in the classroom.
3. In many cases we observed that the attention span increased considerably.
4. The students were less frustrated by errors because the mistakes they made were their own private business, and they discovered very rapidly that they could repeat the programs as many times as they wanted. The machine was patient, did not become aggravated by their errors, and kept presenting the learning material in a continuous and consistent manner.

Negative Aspects:

1. The teaching machines per se presented no problems; the problem was the availability of soft ware. Commercially available programs were either at too high a level or did not present enough repetition for our students.
2. Although programs were written for specific children, it became more and more difficult to conceive of programmed instruction as an integral part of the activities in the classroom, that is, of a curriculum or continuum of experiences and information which led the child to understand relationships in his environment.

Mathematics Curriculm

The math curriculum currently in use at Kendall School was written during the summer of 1968. It is based on the concepts of the new math and is divided into three phases or levels of difficulty. These phases replace traditional grade levels and are correlated in a spiral fashion so that a child may progress both in new content and in the level of difficulty of that content at his own pace.

The computer assisted drill and practice program in math available from Stanford University was found to correlate in both content and organization of content at almost every point with Kendall School's math curriculum. It has been in use here since November, 1968.

Because achievement test data comparing pre-and post-test results cannot be obtained until June of 1969, the following report on the use of CAI in math with deaf students will be based on teacher and pupil reactions observed since November.

One hundred and seven pupils ranging in age from 9 to 21 years of age use CAI on a daily basis. These pupils are working between a first and sixth grade level. They range in ability from retarded to very bright.

The most overwhelming reaction of the pupils is steady and very high motivation. This motivation is apparent in several ways.

No child refuses to come for CAI. The learner nearly always shows disappointment and anger when for some reason they cannot use the teletypes on a given day. Some children actually use their recess time to work on the teletypes.

The concentration of students is almost total as they are working through a lesson. Their faces reflect this concentration as well as their frustration and self-disgust at mistakes and triumph at success. They often humanize their relationship with the teletypes. They become angry, hitting the machine or calling it stupid. These reactions are naturally not acceptable when directed towards a human teacher. When they make a typing error they often say "Excuse me." If for some reason, the machine rejects their number, they say, "The machine doesn't like me today."

High motivation also results in an amazing ability to stick with problems. Several children have continued to work hard on lessons even though they were getting NO problems correct. On one occasion a boy with a history of rejecting any new or difficult material stayed with one lesson, getting the first fourteen problems wrong and the last two right. He showed his paper to his teacher, demonstrating with pride that he had taught himself how to do the problems. In another case a boy who had been unable to learn addition in three previous years learned to add because he was getting addition on the computer and wanted to do well. Finally, students faced with story problems on the machine seem to be able to handle language which defeats them entirely in the classroom. In general, the children accept more frustration and "NO" responses from the teletypes than they can from their teachers.

Another valuable reaction is increased maturity towards learning, especially towards tests and errors. Children may do poorly on a pre-test. They bring the test to their teacher, demanding to be taught this new concept. Often, they are angry with the teacher for not teaching it in the first place. At times they go home and practice on their own, showing improvement on the next day's lessons. They seem to understand more clearly the function of tests. They use their errors to determine what they need to practice. They seem to be able to correct their errors and learn new concepts more easily and with greater speed. The factor of group competition has gradually given way to self-competition and an interest in self-improvement. Many children come away from the teletypes saying, "I really must practice this" or "I improved today."

The teachers reactions have also been very positive. They feel their children learn new concepts more easily in class because they know they will have the same problems on the computer. Teachers have stated that they are teaching more and faster in order to stay ahead of the computer. They are also forced to know the math curriculum more thoroughly in order to present all the concepts worked with on the computer and in order to tie them to previous work.

Teachers have had to adjust to the system in the above ways. But in other ways they are making the system work for them. For example, they use the pre-tests diagnostically to determine exactly the strengths and weaknesses in a given child. They can measure progress more exactly and serve individual needs more efficiently. Since the drudgery of making endless ditto sheets for drill is eliminated, they have more time to spend meeting these needs. Finally, they are asking for lessons to be repeated, omitted or added as it suits the needs of their children. In these efforts Kendall has had excellent cooperation from Stanford.

During the remainder of the year, we plan to investigate several other areas more thoroughly. We are interested in learning if five, six and seven year old deaf students can benefit from CAI drill in math. Brief observations of three primary classes indicate that young children can utilize this mode of drill. Another question we are interested in investigating is whether older deaf students can effectively utilize a CAI tutorial program in Logic written on a fourth grade level. Again, observations to date indicate promising results. Finally, we plan to have a "post-mortem" during the summer to discuss how we can improve and enlarge upon our utilization of the system for the academic year 1969-70.

CHAPTER VIII

EDUCATIONAL TECHNOLOGY and The NECESSARY REVOLUTION IN EDUCATION

by

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EDUCATIONAL TECHNOLOGY AND THE NECESSARY REVOLUTION IN EDUCATION

My students recognize very early that I'm not hardware oriented when they see me with projectors that won't work. I cannot say that I am an expert on how to use the overhead projector, nor do I always know the proper size screen to use. But I think I have more "respect" for media than many media experts whom I have known. I want to thank Wes for that kind introduction. It comes from the heart of a friend. Friends are very hard to get these days, that is, friends who are not "Hungarian friends." (You know, better three enemies than one Hungarian friend.) Of course, enemies have their role to play too. It was Gaylord Von Beksky (I think that is his name), who was reported to have said, that an enemy was a very valuable person to have. You should nourish him. He will spend long hours, sleepless nights, indefatigable energy--all with no hope for any remuneration--trying to poke holes in your arguments. He keeps you on your toes, and sharpens your ideas. You might run the danger of trying to cultivate your enemies until they become friends. If you're successful, they cease to be useful. Von Beksky claimed he lost three of his best enemies that way. So keep your enemies too. But friends like Wes Meierhenry, who can be as constructively critical and helpful as he has been for so many years are rare jewels.

I really don't know specifically what I'm going to say tonight. I am not speaking from a prepared script. I do know there are many things I would like to say. I have an information retrieval system here with me. I have some ideas, some notes, some cards; I have two short films that I may show you; some 35mm slides, and I might want to use the overhead.

We'll start with the Peanut's cartoon in my billfold which one of my students gave me yesterday. We might as well get that out of the way right now. I think it is very appropos. Lucy is saying to Charlie, "I have a lot of questions about life and I'm not getting any answers. I want some real honest to goodness answers. I don't want a lot of opinions, I want answers." And Charlie Brown says, "Would true or false be all right?" This is most appropriate to get us right into that difficult area of educational technology--behavioral objectives and criterion testing procedures.

I am not going to give you very many answers this evening. My behavioral objectives are for you to develop a sense of dread and to become disturbed and to raise some soul-searching questions.

At least it appears that I have your attention. But I do not want to delude myself. I learned long ago, at great psychic cost, not to assume that floating eyeballs mean understanding. Students learn, you know, to keep the instructor off their backs by nodding their heads very frequently...almost on an intermittent reinforcement schedule. But I am planning to do all the talking tonight and that's why I am going to become so brilliant and you are all going to stay so stupid...since those of us who do all the talking do all the learning. This is what I call the professor's syndrome. You'll have to bear with this. In fact, sometimes I am amazed at the things I learn from the things I hear myself saying.

What has happened to you people in special education? You have had some admirable leadership from the Bureau of Education for the Handicapped, and the National Advisory Committee on New Media, which is no longer a going organization for the Office of Education. When I was first introduced to the media efforts in the Bureau of Education for the Handicapped, I said to the then Commissioner of Education, "The Regional Media Centers and the Instructional Media Centers are the closest model that we have in this country today of the innovational model of the 1930's when the Department of Agriculture tried to move the immovable force of the midwest farmer." I felt then, and I still do, that these Instructional Materials Centers and Regional Media Centers (critical as we might be of them as we make site visits and attempt to be constructively critical in asking our pontifical and sometimes embarassing questions) are the best models we have today which could be used throughout the country for all aspects of education. Under the leadership of John Gough, Jim Gallagher, Frank Withrow and many others, you have rare and innovative leadership. As I survey the educational scene, I will not focus my remarks on the education of the deaf because this isn't my specialty. I must be candid and tell you that my interest in your general approval is due to its relationship as a model to the rest of America's public and private education. Therefore, I would appreciate your allowing me to look at your problems against the national problem of education in our society and the requirement for the necessary revolution in education.

Look at your efforts. Innovative, significant, and creative as they have been they are still far short of the goal. I liken them to the Wright Brothers aircraft; they are barely clearing the treetops. You cannot take solace in the fact that the rest of the educational world is walking while you are flying at 1000 feet. All students, not only the handicapped, need a system of education that is equivalent to a moonshot in education. We should be flying our Apollo mission in education right now.

You can take some comfort in the fact that it was the special education movement that made the first serious attack on the "IQ". The "IQ" has been a most unfortunate development in American education. The "IQ" brought with it the opportunity for us to blame our failures in education and our failures as educators on the inabilities of our students to learn. It was this movement within special education that led us to begin diagnosing the student. A few irritating pioneers raised the question that maybe the student, the child, was not so ignorant or moronic as he appeared to be. It might be that the child was just not assimilating the stimuli emitted by the environment. We began to raise questions about the student. It was this kind of perspective that led to the development of a corps of teachers that assumed responsibility for the failure of the students. It was a rare occurance when a group of teachers said, "When the student fails to learn, we have failed to teach."

There is a national effort to emulate this commitment with the National Teachers Corps but it is having a most difficult time getting off the ground. Earlier in my remarks, I asked what has happened to you. Why has this perspective not generated its own aspect of self renewal? Frankly, what I plan to say at this point, is not going to please all of you.

We are running a very serious danger of doing to the deaf and other handicapped children what the Bureau of Indian Affairs did to the Indians of this country. Somehow we have to extend our perspective of the past. I saw a great play last week in New York with a great performer, Alex McCowen in Hadrian VII. There was a statement in it that remained with me. "The past has no future." We cannot affort to rest on the past.

We are a society where, through technology we no longer have to react to the future. We can determine the future. What kind of thinking are you doing as a group to develop the kind of educational system that you already need today, let alone tomorrow? How must our present educational establishment radically change? To be quite candid, I am not very hopeful that we can avoid or escape what I call the dark ages of education. I am convinced that our large city schools are in an acute state of ferment and deterioration; this feeling is rapidly permeating our schools in suburbia. Our whole system of public and private education is tottering. In our schools of education we are unresponsive to the needs of educators, teachers, parents and above all students. I don't know of a single school of education in this country that is seriously addressing itself today to training the teacher for the next five years, let alone the next 10 or 15. Someone said that if the Edsel were a college department, we would still have it with us. We seem to be unable to build into our institutions the renewal mechanisms necessary to survive. We can no longer tolerate the patchwork efforts to revitalize our school systems and to remedy their failures.

We must overhaul the way we are doing things. Simply to talk about the individualization of learning is not enough. You are not going to get a revolution in the process of education without a correlative revolution in the administration. Not to recognize this is to be naive at best, and stupid at worst. The whole system needs overhauling. While it is psychologically burning to the ground, it has become completely unmanageable. When I visit some of the ghetto high schools in the Washington, D. C. area, I get the feeling that some of our youth are in virtual prisons and not a very pleasant prison at that. So while the ashes are settling, we could start now to lay the foundations for the rennaisance of education which must emerge on the rubble.

There is not much that a speaker can accomplish when he lectures as I am doing this evening except to stimulate, provoke or disturb. If I can help to disturb you this evening, then I will feel somewhat successful. It was Kierkegaard who said, "The road to freedom is through dread," and unfortunately we don't have an acute enough sense of dread.

Many of us don't really care enough as yet in our society to surmount the kind of political action necessary to force our statesmen and politicians to deliver the kind of support that is required to launch the "moonshots" and to subsidize the Manhattan size projects in education that are so desparately needed. Further we need to build upon the small models that you have already developed.

It was Lawrence Gould, President Emeritus of Carlton College, who said, "I do not believe the greatest threat to our future is from bombs or guided missiles. I don't think our civilization will die that way. I think it will die when we no longer care."

Now in special education we do have a corps of teachers who care. My question to you is, "To what extent are we supervisors and we administrators and we college professors committing ourselves to arming these teachers with the resources and the skills and the competencies so their care can be translated into significant achievements?"

Arnold Toynbee points out that 19 out of 21 civilizations have died from within and not from enemies without. There were no bands playing or flags waving when the civilization decayed. They died in the quiet and the dark when no one was aware.

We must take some radical steps. We must become revolutionary, not evolutionary. We must become revolutionary in action, attitude, spirit and ideas. We only have two or three decades ahead of us. The profession we know of as education is having its last chance at the bat.

We must first do away with teaching and start thinking anew about learning. "Education," as John Ruskin said, "is not teaching students what they do not know, it means teaching them to behave as they do not behave. It is a painful, continual and difficult work to be done by kindness, by watching, by warning, and by precept and by praise, but above all, by example."

Let me describe briefly and candidly the kind of precept and example we have had. There is no sophisticated awareness of the kind of professional teacher we need on the part of most school administrators. For example, a handbook was distributed to teachers in a large city school system this year. The title on the handbook was "Hello Adventurer." Just imagine a doctor reporting to a hospital and being given a handbook with the insipid title, "Hello Adventurer." In one page of this handbook the teachers were advised to "avoid using jelly glasses, cans, soda or beer bottles as vases on their classroom desks!" This is the gifted administration of this inner-city school system! A self-evaluation section which I can only characterize as stupid and absurd was entitled, "Personal Qualities Affecting Classroom Management" which suggested that a teacher ask herself some of the following:

1. Do you always look well-groomed?
2. Do you possess mental and physical poise?
3. Do you arrive on time?
4. Do you meet difficult situations with confidence and poise?
5. Do you keep a friendly and attractive atmosphere in your room?

What would you think of a teacher who said "no" to all of these questions? The handbook also advised the teachers that they must get permission from their superintendent for any outside jobs and they must report to him any police arrests or civil judgments.

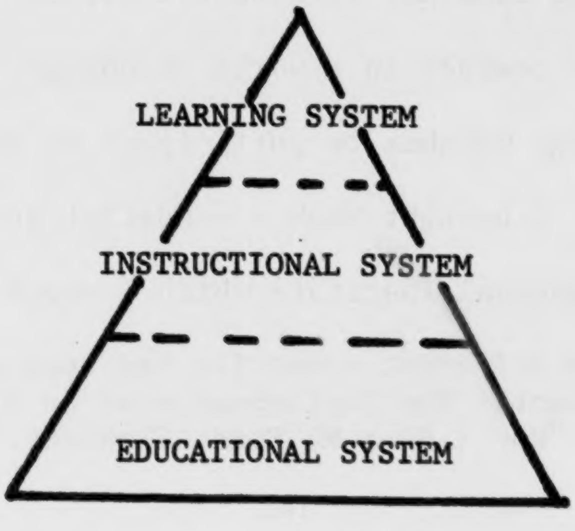
I am trying to speak simply without oversimplifying the issues. I am not attempting to present the substance of a learned article for an obscure journal. I think the time has arrived for our own national concern on the changing role of the teacher in a world of change. I was privileged to be invited to Berlin last October to participate in an international conference on this very theme. I brought back a wonderful story from Kurt Spangerburg of the Berline Pedagogical Institute which I would like to share with you.

> Scientists from different countries had been asked to write a book about the elephant. The Englishman went to Africa and wrote a book entitled, "How I Shot My First Elephant." The Frenchman simply

went to the Zoological Garden in Paris and wrote a book on "The Elephant and His Lovelife." The title of the American book was, "How to Make Bigger and Better Elephants," with a special chapter on "The Elephant and How to Educate It." The Russian's contribution read, The Elephant, A Bulwark In the Fight Against Imperialism." The German, however (and he is a special case, because we educators borrow from the American psychologists who borrow extensively from the German psychologists much of the jargonese in our approach to the problem of learning), locked himself up for seven years in a small room and then surprised the public with a manuscript 870 pages long entitled, "Essay on the Possibility of a Systematic Approach Toward an Ontogenetic and Philogenetic Appraisal of the Elephant with References to the Metaphysical, Sociological and Military Considerations, First Volume, Part I, Introduction."

The novelist, Edith Wharton characterized many experimental psychologists as managing to get into the thick of some very thin things. In education, it is time we started to get into, at least, the thin of some very thick things.

Well then, what must we do? I think there are several things that must be done and they cannot be done without your support. I think I am familiar with most of the educational innovations going on in this country---from the Oak Leaf School in Pittsburgh, to Englewood, New Jersey; south to Nova Schools in Florida, the Duluth, Minnesota program and back to Palo Alto in California. I don't think I know of a single innovation going on in any school that is progressing forward without the moral, psychological and emotional committment of the school administrator and his staff. You must accept the responsibility for innovation and change that rests squarely on the shoulders of the administrator. The system needed to emerge can be represented by a pyramid.



The pyramid has three layers. The top layer of the pyramid represents the learning process and the learning system. The teacher and child are both dealing with the problem of learning. The second layer is the instructional system with all the carrels, computer terminals, teachers, audiovisual devices, media, instruments, tests, and the myriad other tools needed to support the learning process. The third or bottom layer is the educational system, the school board, the citizens, the facilities, the administrators, the supervisors, the state departments of education, etc.---all those needed to support the instructional system which in turn supports the teacher-child relationship.

But that is not the way it is today. You may think that is the way it is, but it just is not that. Our schools are not child-centered; they are not learner centered. School systems are not focused on the learner, and on the learning environment that surrounds the child, the environment in which he lives, in which he is growing and which is allowing him to become, if you would, a more creative, purposeful individual with a healthier self-concept, than he had before. The school as we know it is not a learning environment where the child is learning to learn, where he feels comfortable in manipulating the world of symbols around him. It is not a learning environment which is responsive both to his needs as an individual and his idiosyncracies as a human being. To create a viable, individualized learning environment for all children we need an instructional system which is capable of being tested and revised when it is found wanting.

The instructional system has to be tested and revised and retested and revised again and again until we have found the best possible solution. We must become very much like Edison in his laboratory empirically searching for that filament which would last. We must proceed in much the same way that heart transplanters are searching for those strategies for transplanting human hearts. We must pursue our solutions in much the same way that Salk discovered the vaccine that was so desperately needed. And once we have validated the process, then we need an instructional system to support it; namely, the materials, the media, the teacher, the psychologist, the pediatrician, the whole gamut of people who collectively have scientific knowledge that we need. These and the resources necessary to support the learning process are the instructional system.

The third or bottom layer of the pyramid is the educational system. Here we have all the people and facilities which support the instructional system as I have mentioned above. The point that I would like to emphasize, however, is that the child learning is at the apex of the system. Everything else is subordinate to the learning process. There is no other reason or any other ethical responsibility for anything else we do. The only committment we must have is to the most efficient learning process for each child. If what we do does not serve this purpose, then we must ruthlessly do away with it because it saps our energies, takes our time, and gives us an unrealistic appraisal of what is necessary and what should be done. Only through the use of a technology of education can we then individualize learning in this sense.

May I show you a five minute film which is a model of individualized learning? As you watch the film, please pay special attention to the first minute or so of narration.

> A learner being human, has feelings, interests, hopes. Being human he has knowledge, experience, and attitudes. Being human he is different from his neighbor in every way you can think of. Being human he is unique and important and being human he learns, sometimes a little differently, sometimes a lot differently, sometimes a little slower, sometimes a little faster than his neighbor. So how should he be taught? Must he continue to be taught exactly like his neighbor? Must he continue to be forced to read from the same text, work the same problems, achieve the same objectives? Must he continue to be controlled by a clock that has a face but no head, hands but no heart, direction but no goal? Must he become average? Must we continue to deny his individuality, his humanity? Definitely not. We

can give our best to each according to his special needs and abilities and we are doing so when we apply the principles and techniques of individualized instruction.

It might be appropriate at this point to describe what I mean when I use the term Educational Technology. The word technology comes to us from the Greek derivative of "techne," meaning "art" or "craft" and the word "logos" indicating "a study of." It is the systematic application of scientific knowledge toward solutions of practical problems. Thus, educational technology is the systematic application of scientific knowledge toward the solution of problems in education.

Under the rubric of educational technology we must include the presently known technologies and the, as yet, unforeseen technologies--even if they offer only partial solutions to current problems.

At present we can identify five technologies which indicate reasonable promise in their exploratory stages of development:

1. behavioral technology,
2. communication technology,
3. instrumentation (media) technology,
4. biochemical and neuro-electronics technology, and
5. information technology.

We must be ready to recognize other technologies which are likely to emerge subsequent to those now identified.

Behavioral and communication technology are emerging largely from the infant science of learning. This science has a great deal of maturing to do. It is, however, far from being a theoretical science.

The greatest breakthrough has been in the instrumentation or media field. In fact, the overwhelming nature of these developments may lead us to allow "hardware" concerns to dominate our thinking in preference to the "software" concerns that should be of primary importance at this stage in the development of educational engineers.

The other two technologies, biochemical and information, at this time, are tangential in their impact. The more we learn about:

1) mapping the human brain,
2) the structure and function of the central nervous system,
3) the impact of drugs on neuro-electronic functioning,
4) information theory, and
5) the heuristic and synergistic nature of the elements,

the more we are going to be able to learn how to manage just about every facet of the learning process. It is for this reason that educational technology should be "process" rather than machine or hardware oriented. Priority should be given to systems approaches to instructional and learning problems.

The exploratory efforts made under this orientation to education and training during the last decade support the thesis that instruction can produce predictable learner skills and achievement.

This new technology has largely been an outgrowth of studies in programmed instruction and the related behavioral technology. Such developments will have a drastic impact on the role of the teacher of tomorrow. Through knowledge of behavioral and communication technology, the educational engineer of tomorrow should be able to create a formal systems model for student learning which can be designed, developed and fully validated.

The commitment of tomorrow's educational engineer should be to assist in the design of an educational system or systems which will provide the highest quality education to every individual within an ever-expanding mass educational system which is to be geared to individually prescribed learning. Educational engineers should be able to bring together and to integrate the numerous techniques, procedures and concepts of self-instructional learning systems. This will also allow us to make more effective use of those whom we now call master teachers and thereby eliminate many of the remedial problems facing education today.

I think we must remember that educational technology is still very primitive. It is likely to take some very unusual forms in the next decade or two. We must be sensitive to the scientific developments in this field. We must then be able to readily translate these developments into technologies to fit our educational systems, especially those of us in special education. We should begin to prepare ourselves to use every possible tool and every possible bit of new knowledge which will assist us in helping every child... blind, deaf, defective by retardation and even those with illness...to become healthy. As human beings we must be willing to put into our armory any development to help us do our job.

Facing me on the wall of my office is Keene's portrait of the United Nation's children with their universally hollow and sad, empty eyes. It is a constant reminder to me and to my students that our most disenchanted group is probably students. Our children are still our primary responsibility. The kind of education needed will not be acquired cheaply. The education and educational technology we need is as expensive as our children are precious. Another picture on my wall is a public service advertisement of a poverty-ridden family. The caption reads, "The only trouble with cheap education is that you keep paying for it over and over again."

The new education requires us to consider three components: man, media and message. Many of us in teaching often create learning experiences for the learner which are extremely remote and irrelevant. Except for people like Sam Postlethwait, it is a rare teacher who creates learning experiences that truly affect the learner. There is so much we have yet to learn about how students learn and how teachers "forget" to teach. To talk about the individualization of instruction without much more massive research and development efforts than we have had to date, is to only use the term--to launch a few feeble probes but never to get very far in really understanding what it is we are about. We must look much more critically than we have at what we are doing.

First, we have to know what we are trying to do. I am really tired of hearing people say, "Well, you can measure certain things, but attitudes,insights, values--these are things you can't measure." No, you can't measure them directly, but all of the important objectives have behavioral correlates. And it is through the tunnel of behavior that we measure how we are able to develop insights, attitudes and values.

Every student comes to us at a particular entry level. We want every student to reach mastery level. The question is how do we help every student to attain mastery. I am reminded of the student who asked Dr. Skinner at an APA meeting several years ago, what he thought of Jerome Brunner's dictum that, "you can teach anything to anybody at any age level in an intellectually honest manner." Dr. Skinner shrugged his shoulders and replied, "How?"

Technology is the only way that I know of that we can scientifically go about doing our job at this point. And, technology needs much more extensive research than we have had to date. On the other hand, it is through technology that we can measure what it is we are doing in education.

After we know what it is we are trying to do, we then must ask what is our student like? You know there is an old saying, "If you don't know where you are going, any road will get you there." Here again we have defaulted in our research. We have overemphasized the "IQ", excessively relied on personality measures such as Bernreuter and others, and then said, "This is it."

There are two kinds of questions we must ask in making assessments of students. The first question is, "How much mastery does the student already have? Or, how much of what we want him to learn does he already know?" The second question is, "How qualified is he to learn? What are the competencies that he has?" This is a question that you people in special education ask repeatedly regarding the handicapped child. But it is a question we should be asking about every child.

By the year 1980, if we are up to it, there should be no special education schools. There should be no special education classes, because every child in every class in every school will be a case of special education. Every child has hidden handicaps and every child has hidden achievements and competencies and every child has obvious handicaps and obvious achievements and competencies. We must begin to understand every child as the separate, unique and idiosyncratic human being that he is. But, we have yet to develop the diagnostic instruments that will describe every child to us.

We know who the deaf are because they are easily observable. But what about the isolates, the apparently normal children, who never get in anybody's way? What about the child who hates to learn, who feels threatened by learning? What about the child who has a poor self-concept? What about the child who just hates himself and hates the whole structure of his society? Is this not a handicap? Are we going to develop educational community parks for tomorrow where every child enters as a unique human being, participates with all other children who are also unique but still be able to participate with other children and learn from them as well as they learn from him? Will the deaf children and the blind children be amoung this group or will they be in categories of their own? Can we build on our foundations of today? Can we transform the very structure by which we are serving a particular group today?

Educational technology is, among many other things, the design and development of empirically valid learning systems which we then mediate and package in order to mass-produce them and make them available to anyone, anytime, anywhere, when they want them and when they need them. Therefore, validated learning materials, which we are far from producing (although we do have a few viable learning materials) are those that have been engineered and tested to produce learning to a predetermined proficiency with representative groups of students. Programmed instruction is not a medium. Programmed instruction is a process bringing together all the necessary media to develop the most effective footlocker or kit of materials so we can have completely adaptive systems that can ultimately be sent through computers and remote access systems to human receivers. The media is the carrier. Too many of our teachers have been simply mediators and information dispensers. They haven't been managers of learning.

Through the electronic media the teacher can manage the learning process. The student can then learn wherever he might be, at any time that he needs it, or anytime that he is directed to do so by some adult. This is a dial system. The student can receive both audio and visual messages. To look at a child in a booth is not to look at a child being dehumanized, but rather to look upon the media as a tool. If we ever lose sight of that, we are in trouble. There are children who can rely on only one or two sensory modes. But we must continually ask, are there no other ways to get to them and have we fully put to use their limited sensory apparatus.

In George Lenoard's visionary book Education and Ecstacy he reminds us that, "Every child, every person can delight in learning. A new education is already here, thrusting up in spite of every barrier built against it. Anyone who blocks learning, especially in a small child, is guilty of an enormous crime."

It is in the light of that commitment that we may someday recognize that one-third of our teachers are not only unnecessary, but may be harmful to many children. It may be better to assign a hundred children to an outstanding teacher than to assign twenty-five children to a mediocre or damaging one who may eternally contaminate the children. Possibly through technology, one teacher may be able to manage one hundred children.

Through the imperative need to individualize instruction, we recognize the kind of commitment and craftsmanship that is necessary to accomplish our task. If human beings are unique, then any system of fixed scheduling and mass instruction must be inefficient. It may seem tidy and convenient, but that is an illusion. Let's stop serving the administrative machine of efficiency and let's start serving the learning child.

Now there is a danger. The danger is that automation and technology in the hands of evil men may propel us into the predicted Orwellian horror of 1984. It is not the machines that dehumanize children but rather adults who dehumanize children. The machine is never frustrated with a child, never loses patience and in the hands of a master teacher; becomes a great tool.

It was Carl Rogers who said, "The only man who is educated is the man who has learned how to adapt and change." I ask you then if we who call ourselves educators can consider ourselves to be truly educated. The man who is educated is the man who has realized that no knowledge is secure and only the prospect of seeking knowledge is the basis for security. What we have to do is ask ourselves to what extent are we part of the problem. What should be done about breaking the lock step and going into individualization of learning in a revolutionary manner?

One of the first things we can do is marshall our resources as a professional group of educators. We have to stop cooperating with and compromising with the default in educational commitment which is going on in this country. It was just a few days ago that many of you read in the newspapers that Mr. Nixon accepted a modified antiballistic missle which will cost this country ten billion dollars as a starter. By the way, one billion dollars can be measured by imagining one dollar spent every minute since Jesus of Nazareth was born until the year 1903. Ten billion dollars! The supersonic transport will cost this country another five billion dollars. NASA is asking for 10 moon landings which will cost another 25 billion dollars. The Vietnam war is costing us two billion dollars a month. On the other hand, when it was announced on the bottom lefthand corner of the front page of the Washington Post that the modified ABM would be approved, it was also announced that the Head Start Program in the District of Columbia was cut by one-third.

Where is our national educational leadership at this time? Where are the leaders of our professional organizations? Where are our principals and our supervisors? Where are the school boards? Where are the so called concerned parents? Where is the political action and militancy that is so desperately needed to say to our national government that once this country makes up its mind to solve a problem, it can do so? The Apollo missile demonstrated this. So what are we doing? How long are we going to tolerate the measly crumbs that come to us from the round table of government? How long are we, in education going to be so simply satisfied--to go away with our research grants or to do our pet projects? How long are we going to worry about the concept of freedom to do basic research, when problems are crying for solutions? Where is our political action? What are we doing to change the face of education?

Since 1957 and the advent of Sputnik, American educators have been challenged with winning the cold war of the "isms!" The educational thrust has brought the federal government into education at all levels as never before known in the history of this country. There is an illusion rampant that progress is being made.

The Elementary and Secondary Education and Higher Education Acts have been the bulwark of this thrust, making it possible for school years to be extended downward and upward. At the same time the United States finds itself deeply enmeshed in a hot, bitter war. Simultaneously the majority of citizens of this country are experiencing an affluency unknown in the past and yet they are torn apart by political, social and economic forces. The results of this confrontation are directed toward the educational establishment.

It is nothing short of tragic that a country which has educated some of its people to a sophistication of technology able to plan a moon landing in July of 1969, down to the very minute--if not seconds--is the same country that is also unable to cope with the misery, want, and bureaucracy of the tormented urban lives of its people. It is tragic that this country cannot develop solutions to its people problems. This country is being torn apart by alienation of generations when analyzing its hierarchy of values.

The question is which problem is more important for our survival as a nation of people dedicated to human freedom with equal opportunity for all--our world problems or our national problems. Throughout this turmoil of national direction and commitment there is a growing realization that education is a long-term answer to man's problems, both within and without the country.

It was the late Robert F. Kennedy who said, "Some people agree with things as they are and ask 'why' and others dream of things that never were and ask 'why not'"? Can I take time now to draw for you a picture of how things could be in the field of education? Could we imagine that by the year 1984 in some modern educational center where we no longer have principals and superintendents, that a director of the center is interviewing a master teacher who is joining his staff and has been in training and internship for about ten years. He tells her that she was very carefully selected for this center. "As you know," he continues, "it took a long time, but we finally recognized that it is not the college professor or the secondary teacher who is the most important, but the pre-school and elementary teacher who deals with the child in his formative years. We want you to know that everything is here to serve you and the children you will be working with." As they talk, pictures of the children flash on the screen behind him while a computer prints out the diagnostic assessment of each child. "Here are the profiles on these children, and, by the way, there are many other resources available to you. First of all, I want to tell you that you have no lunch hours to attend, no fixed schedule, and the children are your charges. You are their parent surrogate if you will. They are under your control. Let me show you pictures of the bus driver who will help you whenever you need him; your clerk typist; and your three aides. One is brand new, one has been here for two years and the other for three and she is scheduled for assignment. Here is the pediatrician, the psychiatrist, the librarian. Here are your dial access materials, your office, your counseling chamber, and here are your small discussion rooms. You don't have to go to PTA meetings, you don't have to spend any time putting last year's golashes on this year's shoes. You don't have to fill out any forms. You don't have to give any grades. All we are asking you to do is change the profiles for these children. Now your beginning salary is $30,000 per year."

I hear some of you laughing. Why? Shouldn't a teacher as important as this teacher be worth what we pay an average pediatrician? Not to mention that by 1984 inflation will have some effect. Why can our society support antiballistic missles and not this type of program?

The Center Director continues, "Right now, these children provide you with a broad range of abilities. If you change these profiles on the average of 50%, you will go from level three where you are assigned now to level two. And next year, if you are good enough to go to level two, we will give you a few underachievers and several ungifted and hostile students. If you are successful enough with these students you salary will go to 35 - 40 thousand and you will have more assistants! Someday, you may be good enough to become a level one teacher. Then your salary will be $40,000 and you will have the most difficult children we have...a few deaf, some blind, some emotionally disturbed. We are not going to tell you how to do your job any more than a hospital tells a surgeon how to operate. Your time is your own. All we are interested in is results."

What we are really talking about is a "Manager of Learning." We want to equip a teacher so that she has a completely adaptive, individualized learning system available for every child. We are just now ready to admit that we are on the threshold of discovering how to educate, and rather than despair on the rubble of educational institutions and the wasted human lives surrounding us, let us take hope in the application of our scientific and technological know-how to unlock the problems of man through education. Even though the new education may be just a glimmer in the minds and hearts of a few people, we must let go of the present tottering educational system and build anew. It is no longer an idle remark that our schools have outlived their usefulness. At least 50% of the present clientele are not having their needs met by today's schools. These children range from minority groups living in harsh environments to those with unrecognized learning disabilities affecting their potential for life style and human relationships.

One of the great musical plays of this century is Man of LaMancha. In our modern age of cynicism, we need this type of play. I think the challenge that should be permanent in our thinking is embodied in that great song, "The Impossible Dream," from the play. We all need...

To dream the impossible dream,
To fight the unbeatable foe,
To bear with unbearable sorrow,
To run where the brave dare not go.

To right the unrightable wrong,
To love pure and chaste from afar,
To try when your arms are too weary,
To reach the unreachable star.

This is my quest.
To follow that star,
No matter how hopeless,
No matter how far.

To fight for the right
Without question or pause.
To be willing to march
Into hell for a heavenly cause.

And I know if I'll only be true,
To this glorious quest,
That my heart will lie peaceful and calm,
When I'm laid to my rest.

And the world will be better for this,
That one man scorned and covered with scars,
Still strove with his last ounce of courage,
To reach the unreachable star.

Has this not been the history of special education? Can we sustain it?

CHAPTER IX

USE OF PROGRAMMED INSTRUCTION WITH EMOTIONALLY DISTURBED DEAF BOYS

by

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Paper prepared for Symposium on Research and Utilization of Educational Media for Teaching the Deaf, March 17-19, 1969, Lincoln, Nebraska.

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Robert K. Lennan began his professional career in 1951 as a Dormitory Counselor and Physical Education Instructor at the American School for the Deaf in Hartford. In 1953 he became a teacher at the New York School for the Deaf in White Plains, and in 1957 he joined the instructional staff of the California School for the Deaf in Riverside. During 1965 and 1966 he served as Administrative Assistant to the Project Director, Leadership Training Program in the Area of the Deaf, San Fernando Valley State College. In 1966 he returned to the California School for the Deaf as Supervisor for the Pilot Project for Emotionally Disturbed Boys. Currently he is preparing the final report for the Pilot Project and serving as Director of the Instructional Media Center at the California School for the Deaf.

Mr. Lennan is enrolled at the University of Southern California studying for his doctorate in Instructional Technology. He has an M.A. in Administration and Supervision from San Fernando Valley State College (1965), another M.S. from Gallaudet College in Education of the Deaf. His B.A. was obtained in 1951 from Springfield College in Massachusetts.

USE OF PROGRAMMED INSTRUCTION WITH EMOTIONALLY DISTURBED DEAF BOYS

One of the major problems confronting educators of the deaf today is the education of the multiply handicapped deaf child (Babbidge, H.D. et al, 1965). A survey carried out in the State of California last spring reported 1,700 children under the age of sixteen with one or more handicapping conditions in addition to deafness (Calvert, 1968). The findings of this survey provide us with an indication of the severity of the problem on a national scale.

Experience has shown that these children do not respond to the traditional methods which we have employed with varying degrees of success in educating deaf children in the past. It will be necessary to explore new approaches to instruction if we are to develop effective educational programs for multi-handicapped deaf children. One possible approach that shows promise for increasing our effectiveness in working with these children is the use of programmed instruction.

I would like to describe for you the development and use of programmed instructional materials in an experimental program for emotionally disturbed deaf boys at the California School for the Deaf, Riverside, which was carried on under a grant from the U. S. Office of Education.

Sixteen subjects, ranging in age from 7 through 12, were selected for the study, all of whom met the following criteria: A) Prelingually deaf with hearing levels of 65 db or worse in the better ear, B) A minimum intelligence level of dull-normal or a performance I. Q. of 85 or above obtained through the use of an objective, non-verbal test, C) No gross neurological dysfunction as determined by both a neurologist and a pediatrician, and D) A history of emotional problems that had prevented satisfactory adjustment and achievement in an educational program for deaf children as presently organized.

The subjects selected had widely varying educational backgrounds. Two were former patients in a state hospital for the mentally ill with no prior enrollment in any educational program. One was a former patient in a state hospital for the mentally ill with prior enrollments at the California School for the Deaf, Riverside, and in a day class for the deaf. Another child had been in a workshop for mentally retarded children and prior to that had been a patient in a state hospital for the mentally retarded for a period of three months. Four had formerly been enrolled in a day class for the deaf but had been excluded because of emotional problems. Four were enrolled in day school or day class programs for the deaf but were referred for admission because of emotional problems that were causing consistent academic and social failure. And four were from the California School for the Deaf who were experiencing similar problems.

The children selected for the project exhibited a wide range of deviant behavior. One child spent long periods of time screaming while staring at his hand which he held in a contorted postion. He would mark his desk, the walls, and the floor with crayons, pencils, or any other writing instrument he could lay his hands on. Almost every day he would tear his clothes or pull the buttons from them. Another child was preoccupied with flourescent lights and spent most of his time staring at the lights in the classroom or drawing light fixtures. Several children exhibited aggressive acting-out behavior in their relationships with other children and with their teachers. Many were hyperactive and had a very short attention span, and some were withdrawn and spent much of their time in fantasy.

Seven of the subjects had no formal receptive or expressive communication, while the remaining nine had varying degrees of skill in oral and/or manual communication. Because of the wide variance in communication ability and the limited educational backgrounds of the majority of the subjects, it was necessary to provide a highly individualized instructional program. This was done by maintaining a ratio of four students to a teacher and through the development of specialized materials. Instruction was limited to the areas of language and mathematics. It was postulated that subjects who were able to overcome their behavioral problems to a sufficient extent to be integrated into a regular class for deaf children would require basic skills in language and mathematics if they were to achieve academic success in the new setting.

A survey of commercially available materials showed them to be inappropriate for working with children functioning at the level of most of the subjects in the project. The only commercially prepared materials used were the SRA Mathematics workbooks, the Sullivan programmed reading series, and the Fitzhugh Plus Program materials. The teaching staff was given instruction in the development of programmed instructional materials during the month of in-service training prior to the arrival of the children. The programmed format was selected as the medium of instructional materials for several reasons: 1. Because of the widely divergent educational backgrounds of the children, a high degree of individualized instruction was necessary. Programmed materials provided an independent activity which would reinforce the concepts taught by the teacher and permit the children to work at their own pace. They also served a diagnostic function in indicating areas where additional instruction was needed. 2. Programmed materials provided the child with the many repetitions necessary for the development of language concepts through a series of small, logical arranged visual stimuli. In this way the visual input channel was effectively employed to provide a partial substitution for the auditory channel through which language development takes place in a hearing child. 3. These materials were consistent with the use of behavior modification techniques being used, since they provided immediate knowledge of results and positive reinforcement for correct responses. Perhaps I should digress at this point and provide a definition of programmed instruction for those of you who may not be familiar with it. Programmed instruction is a kind of learning experience in which the program functions much like a tutor for the student by presenting the subject matter to be learned in a series of small, carefully sequenced steps or frames. The learner proceeding at his own rate is required to make an active response to each stimulus item and is reinforced by being provided with immediate knowledge of results.

Espich and Williams (1967) point out that "programmed instruction takes advantage of the basic human drive for success. The program guides the student toward making the correct response. It then shows or tells the student that he has given the desired response--that he has been successful. Each time he makes the correct response, he is positively reinforced by being told that he is correct; his drive for success is satisfied. Each time his drive for success is satisfied, the probability increases that he will make the correct response to the given stimulus in a future situation."

Our first step in developing programmed materials for the children in the project was to determine their skill level or entering behavior. Just as a teacher cannot perform at peak efficiency unless he knows the capabilities of his students, the program writer must be aware of the ability of his target population in order to establish a starting point for his program. As stated earlier, preadmission evaluation and classroom observation indicated that the majority of our students were lacking in basic verbal skills. Thus, the primary goal of our initial programming efforts was to develop basic vocabulary and language patterns.

Our second step was to determine the concepts to be taught. To this end a course of study was developed which listed the nouns, verbs, and adjectives that would be included in the instructional program. We decided to concentrate first on teaching the children the names of parts of their bodies. Later we worked on the names of articles of clothing and appropriate language for expressing their various personal needs. Because these concepts were of primary concern to the children, we felt that they would be more motivating than others farther removed from their immediate frame of reference.

Next, we listed our instructional goals in terms of behavioral objectives. A behavioral objective describes what the learner must be able to do, under what conditions, and the criteria for acceptable performance. An example of one of these objectives is as follows: "Identify from pictures or from parts of the body pointed out by the teacher and match to the names of 90% of the words in list "A" and 75% of the words in list "B"." By stating objectives in this manner we committed ourselves to an objective evaluation of the effectiveness of the materials in accomplishing the function for which they had been designed. One of the teachers developed the form shown in Figure I to record the performance of her students as she carried out her evaluation procedures each week.

Now, with the preliminary planning steps accomplished, we were ready to begin writing frames. Each of the teachers developed a series of frames which were designed to teach the name of one part of the body. These were submitted for evaluation by their fellow teachers and revisions were made on the basis of suggestions that resulted. In this way, a variety of imaginative techniques were devised and refined. These were incorporated to make up a basic sequence of frames that were repeated for each new word. This sort of repetition would normally be quite boring for most children, but we found that our students were more comfortable with a uniform response pattern of this sort. We next produced a draft of the program to be tried out with our students. Their performance would indicate the need for further revisions. This test program was put on 5 x 8 file cards which were then laminated. Laminating the cards permitted us to try out the programs with several of our students, since their responses written with a water soluable marking pen were easily erased with a moist Kleenex. An assembly line was set up to prepare many frames that made up the product of our initial programming efforts. One teacher did all of the typing, another did the coloring of cues and color coding of parts of speech, a third laminated the cards and we were fortunate in having a

Name: John
Class: "A"
Teacher: Miss Smith
Date: 1/19/68

EVALUATION

Objective:	Match object to name	Fingerspell name of object	Write name of object	Use name in a sentence
Evaluation procedure:	use flashcards in slot charts, have child point to name	show picture or point to object, child finger-spells name	show picture or point to object, child writes name	Show picture or object, child writes sentence
Vocabulary:				
Shoe(s)	X	X	X	X
Socks(s)	X	X	X	X
Shirt	X	X	X	X
Pants	X	X	X	X
Belt	X	X	X	X
Handkerchief	0	0	0	0
Button	X	0	0	0
Zipper	X	0	0	0
Coat	X	X	X	X
Hat	X	X	X	X
Percentage Expected	90%	90%	70%	60%
Percentage achieved	90%	70%	70%	60%

Figure 1

teacher with artistic talent who took care of all of the illustrations. Preparing the program in this manner also provided us with a uniform format which we would not have obtained if entire segments of the program were prepared by individual teachers.

Students were observed as they went through the program, and a record was made of frames that seemed to be causing them difficulty. These observations led us to add more frames for each concept taught and to incorporate more cues and prompts. The revised version of the program was then put on ditto masters and produced for general use.

Following this initial group effort, the teachers working alone continued to produce a series of small adjunct programs which were designed to teach single concepts as a supplement to the teacher's instruction. In developing these materials they continued to seek the critical evaluation of other staff members and shared the finished products of their efforts with them.

Other forms of instructional media utilized by the teaching staff included 35mm color slides and Super-eight movie films. The slides were employed to teach a wide variety of vocabulary concepts. They were prepared in both captioned and uncaptioned versions for use not only for group instruction by the teacher but also for individual review and practice by the children using a slide viewer in a study carrell. Using an Instamatic movie camera, teachers filmed all field trips. These films were used to teach the vocabulary and language concepts associated with the experience. Later, the films were edited and question forms inserted to provide a programmed format for eliciting responses.

The response of the children to these materials was most gratifying.

Unable to sit at their desks for more than a few minutes at a time when they first entered the program, they were now working diligently for periods of as long as thirty minutes in activities which they found both interesting and rewarding. The effectiveness of these materials in accomplishing the purpose for which they had been designed was shown by the performance of our students during the periodic evaluations by their teachers.

The development of programmed materials requires a great deal of time and work; but the end result is well worth the effort involved, not only in terms of its effectiveness as a teaching tool but also in terms of the changes it brings about in the teacher's effectiveness in planning and her perception of her role in carrying out her instructional program.

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CHAPTER X

THE ROLE OF MEDIA IN INDIVIDUALIZED INSTRUCTION FOR TEACHING THE DEAF

by

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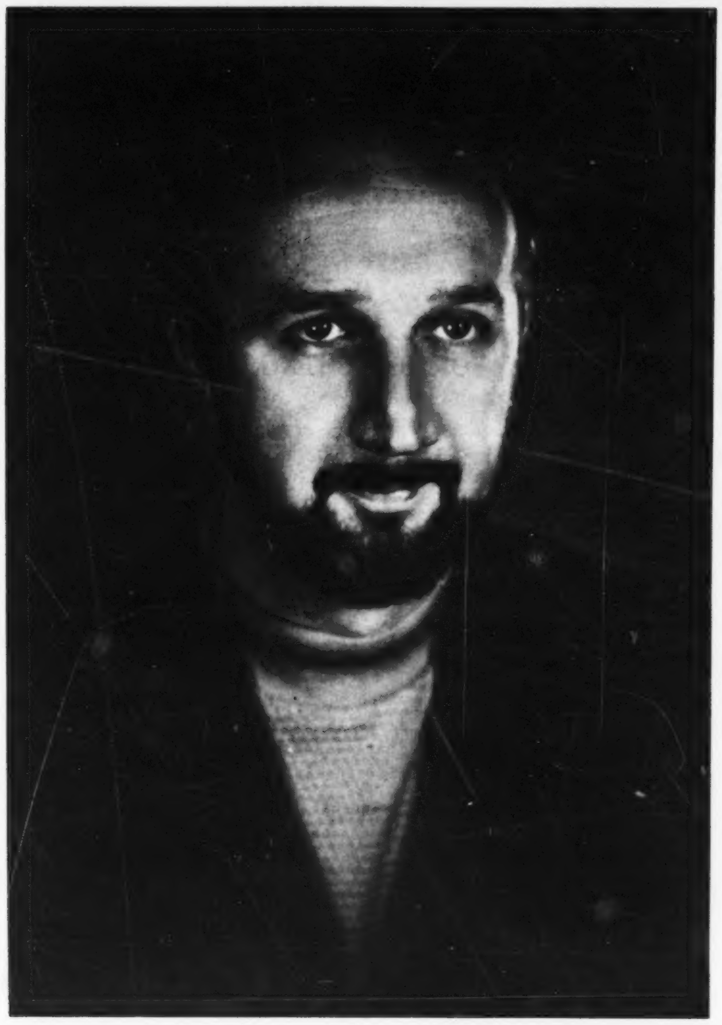

Donald G. Perrin is Assistant Professor of Education and Cinema at the University of Southern California. Dr. Perrin obtained his A.B. degree from the University of Southern California in 1960; his M.A. in 1962 and received his Ph.D. in January of 1969. Dr. Perrin will join the staff of the University of Maryland in the fall of 1969.

One of the pioneer professionals in the area of instructional technology, Dr. Perrin has been involved in numerous research projects in this field and has authored a large number of articles which have been published in professional journals. His professional experiences have been varied. He has directed the 1967 USC Summer Institute for Disadvantaged Youth; has been instructor at various media institutes; in 1963-64 was a Research Assistant for Machine Programmed Instruction; and before that he was a Research Associate for the NEA Technological Development Project. From 1954-57 he was Writer/Director of a film unit that made numerous award-winning movies in Melbourne, Australia. At the present time he is, in addition to his role at USC, a consultant to the John Tracy Clinic and to the Pilot Project at the California School for the Deaf in Riverside.

THE ROLE OF MEDIA IN INDIVIDUALIZED INSTRUCTION FOR TEACHING THE DEAF

Recent research by Travers (1966) shows that for hearing adults, print is superior to sound in learning vocabulary. Print and sound are essentially synonymous in this instance, but sound is slower to present--usually 125 to 250 words per minute. Broadbent (1962) has shown that we cannot interpret two separate voice messages simultaneously. The ear is an essentially linear device, where information must be processed in sequence.

The eye is more flexible. Reading experts train us to scan down the center of the page using increasingly wide columns of print, so ultimately, reading is five to ten times faster than normal speech.

The eye has one greater facility--instant recognition of objects along with their spatial and temporal relationships. Visual language is not linear but simultaneous: its vocabulary and grammar are of a different nature to spoken language.

> Visual forms--lines, colors, proportions, etc.--are just as capable of _articulation_, i.e. of complex combination, as words. But the laws that govern this sort of articulation are altogether different from the laws of syntax that govern language. The most radical difference is that visual forms are not _discursive_. They do not present their constituents successively, but simultaneously, so that relations determining a visual structure are grasped with one act of vision. Their complexity, consequently, is not limited, as the complexity of discourse is limited, by what the mind can retain from the beginning of an apperceptive act to the end of it. (Langer 1942)

The eye provides a multiple channel input to the brain without the need for an intermediate language. Unfortunately, much of this natural language ability has been lost through increasing dependence on verbal communication. This trend was accentuated in the last five hundred years by the invention of movable type. This is a disadvantage to the deaf, since written language is an imperfect set of symbols to represent the spoken word, with an even more stringent grammar. Adoption of a truly phonetic alphabet, like the Bernard Shaw alphabet, would simplify one of these transitions, but spoken words, like all symbols, have great variability in meaning. Pfau's paper (1969) demands requoting here:

> Of the 450,000 words in the English language, only 150 are function words (the balance are lexical). Yet these few words comprise about one third of our output of daily language. The task of teaching the correct usage of these words to deaf children is awesome since many of them have 40 or 50 different meanings. Fries found, for example, that Thorndike's 500 most frequently used words conveyed a total of 14,070 different meanings, or an average of about 28 meanings per word.

Verbal discourse is expedient for hearing people, and represents a great advance over natural language. Photography, motion pictures, and McLuhan's "electric communications" (1964) have presented similar advantages to the hearing, and lesser advantage to the deaf, even with the advent of captioned films and television. The advantage is greatest with films which are essentially visual, single concept short films like Vegetable Printing or Nest Building, and least with films which are mere visual accompaniments for a verbal script. "Illustrated lectures" and many theatrical films fall into this category.

The problem is two pronged. Much of our visual experience cannot be translated into words. Compare for example the experience of seeing an aardvark with a verbal description of the animal. The popular game in audio-visual classes of supplying the description and asking students to draw it illustrates the inadequacy of translation. More complex situations present even greater difficulty. Thus, there are whole areas of human experience not found in printed literature because of its limited vocabulary and expression. The ancients may well have had the right approach when they developed pictograms. I wish some modern society still used them so we could compare their value in communication of visual experience. Direct visual experience is unique, but its communication is difficult because only part of the experience can be translated into spoken or written symbols. Without an adequate means of visual communication, the remainder of the experience terminates with the receiver.

The second problem arises because films and other visual experiences are often developed from a verbal script which, by definition, eliminates those areas of experience which are uniquely visual. Hence our culture and our system of education has progressively abandoned the visual and temporal environment for which our brain is so aptly designed, and developed principally the symbolic or verbal capacity. We are much more likely to use a film, captioned or otherwise, to develop verbal ability, than to exploit its visual elements through pantomime or drawing. Words and images represent two distinctly different languages, both of which must be learned and understood. Words are symbols, abstractions of reality whose meaning is determined by experience. Images approximate direct experience, and furthermore, the vocabulary is different, the grammar is different and the means of communication is different.

Several projects in the past few years have put simple movie cameras in the hands of five and six year olds, and several rolls of film later, their product was comparable to what is seen on television--step-by-step storytelling with steady, well framed images. A New York experiment provided cameras for a group with language difficulty and low motivation. In three months the group progressed markedly. Bob Lennan at the Riverside School for the Deaf proved films of field trips and class activities had similar value in motivating students and developing verbal language . This indicates several things. Film is not limited to its conventional use of viewing a professionally produced product; it is a tool for visual communication by students. Just as essays tell us what a student is thinking--in words, films tell us how he perceives his environment visually. Apparently a six-year-old can emulate the level of visual communication used in films and television. This is both encouraging and distressing. It is encouraging because it opens up a whole area of communication for further development. It is also distressing to realize that visual communication is, as yet, so under-developed.

It is logical, where the sense of hearing is impaired, to emphasize the development of sight communications. But if the visual development of our society as a whole is at the level of a six-year old (or less), what kind of development would be logical? In working with some film-makers, I have experienced film sequences I could not interpret; the images came too fast, their relationships were too tenuous for my present level of experience. Continued exposure to these materials raised my level of visual literacy, much as a student in art appreciation learns to interpret painting and sculpture. Film language is limited, for most of us, to the close-up, the montage, and the superimposition as developed some 40, 50, or 60 years ago. With some formal training (as we have with verbal language) the potency of visual communication could be extended enormously. Preferably this would begin at an early age level.

Recent research indicates that language ability is developed in the first five or six years of life, and capacity to initiate language after this time is quite limited. Most of us are well aware of this in terms of the deaf, but Gerard (1953) reports an equivalent problem in terms of the blind.

> adults gaining vision for the first time must labor for months to recognize a circle and to distinguish it from a triangle, let alone see letters and words.

If we are to increase visual literacy, it must be developed early. It is highly probable that the significant contributions in this area will not come from the highly verbally oriented scholar who succeeds so well in our schools and colleges. It may come from film makers, artists, or from children. Incidentally, the first national conference on visual literacy will be held in Rochester one week from now.

Wooldridge (1963) suggests that sensory development occurs to meet biological necessity. Primitive man had a highly developed visual sense. The Australian aborigine can follow a man or animal through the bush hours later by observing broken twigs and disturbed leaves. When man needed to hunt no longer, this sense was lost by disuse. It seems that the biological capability for acute visual observations and interpretation is lost to modern man because it is not developed in those crucial early years.

The development and ultimate success of a deaf person hinges, more than all else, on his ability to communicate--to initiate and propagate ideas--and to interpret communications from other persons and from the environment. If you cannot hear a car as you cross the road, you are increasingly dependent on visual cues. If you cannot hear a person speak, you are dependent on expression in the face and eyes to add fine shades of meaning. The fragmentary visual cues are difficult to interpret. How do we develop greater visual sensitivity, and how do we train visual interpretation? Cued speech seems to be one of the more important developments to make speech meaningful and simple. But symbol systems do not substitute for trained observation and interpretation, they simply allow a different kind of communication.

Finn (1961) suggests that verbal and visual learning must go hand in hand. Certainly we could do more in teaching verbal language to the deaf if we made greater use of visual experiences. I also believe that our approach to visual communication is wrong. Small screens and carefully selected images may be admirable for some purposes, but in the real world, we are surrounded by images, and must learn to make our own selections and determine the significant relationships for ourselves. Dr. Ray's (1968) experiences-room, with life-size images, low enough for children to touch, seems an ideal environment to test out some of these ideas. Blackwell's (1968) data, indicates that large bright images transmit more information than small images of equal brightness. Terlouw of Eastman Kodak confirmed this by a simple experiment. He invited several subjects to view slides on their own in a small room, some with a large screen, others with a small one. Those who viewed the larger image spent almost twice as much time on each slide; they also learned significantly more details and relationships. For example, with a small image, the viewer would remember seeing a boat; the large image enabled viewers to remember persons on the deck and what they were doing.

Television gives the viewer a choice at the turn of the dial; large screen images and theatre likewise present a wide field from which the viewer selects; the real world offers extensive choice. Must the classroom always focus on one thing at a time as determined by the teacher? Even the richest classroom is empty and sterile compared to the world it represents. The best way to extend the classroom is to experience the outside environment directly; the next best way, and perhaps the simplest, through images--slides, filmstrips, films, and television. To this I would add large life-sized images which encompass the field of view--create (or simulate) an environment--and encourage the student to use his selective powers of observation.

A further extension is to have a reactive environment. At the psychomotor level we have simulators such as the Drivotrainer; for other cognitive and affective learnings we have the teaching machine. It is an interactive device which facilitates the presentation of validated instruction. Many of the earlier definitions (Finn and Perrin 1962) were mechanistic, and completely divorced from learning objectives. If we employ programmed instruction, we must be concerned with two things; the constant interaction of the learner with the program; and the necessity to revise the program (on the basis of student response data) to achieve its pre-determined objectives. If we are not concerned with feedback and immediate knowledge of results, books and films would seem more appropriate. If the material is not revised and validated, it is not a program since, by definition, programmed instruction is validated instruction. Some instructional films have clearer objectives and better validation than many materials now in programmed format (I hesitate to call them programs).

Learning is not synonymous with perception. Gagne (1965) names several different mechanisms by which learning may take place. Wooldridge (1963) and others have shown great concern about what happens beyond perception to imprint what is learned in the memory. I suspect we have been far too concerned with communication information per se to pay the proper attention to motivation, transfer, meaning, distributed practice, and other aspects of the process we know to be important. I also suspect our research has paid far too much attention to the immediate after-test. Kleinsmith (1962, 1963, 1964) and Levonian (1964) have produced some fascinating data regarding the retention of learning. If the learning experience is sufficiently exciting to cause arousal as measured by skin conductivity, response to an immediate after-test is poor, but improves with time. The reverse is also true. Wooldridge (1963) further indicates that concentration should be extended for a short period while learning is transferred to the long term memory. Pro-active and retro-active inhibition result when new information competes for attention with information (not yet consolidated into the permanent memory).

Media serve two functions in the classroom for the deaf. They are an extension of the teacher, as with programmed instruction and other interactive devices; and they are an extension of the environment, as with films. Combination of both is advantageous. Media have a capacity to motivate and focus the attention of the student, to communicate through visual and sound and print; to organize information and activities to present difficult learning sequences in small steps; to provide immediate knowledge of results; to allow students choice appropriate to their interests and needs; to monitor a student's progress and inform the instructor and/or the student when help is needed. Until now our use of media has been restrictive rather than expansive. For example, films have restricted the viewer to specific elements chosen by the director, and programmed instruction has oft times "shaped" the student with a long sequence of redundant verbal information. Programmed instruction has also, for no good reason, limited student response to name calling or button pushing.

I would like to explore some ideas as presented by an innovative teacher to see if (a) creative student interaction can be encouraged by giving him a wider choice; (b) presentation can be socratic and involve a range of media; and (c) whether a variety of responses would make the learning more interesting, and (d) whether the visual could ever be a dominant rather than supplementary part of the communication.

Consider the Cartesian Spiral. This lesson has three objectives:

1. to identify the cartesian spiral
2. to name five examples found in nature
3. to describe the forces which create this shape

The first objective involves visual recognition, the second, verbal association, and the third deals with relationships at the level of analysis and synthesis.

It could be another chalk-talk by the teacher, a film (illustrated lecture), a program, or computer assisted instruction. Consider the following set of experiences and dialogue.

The student is presented with a box containing a wide variety of shells. What do they have in common?

> (The student has time to study the shells, make some notes if he wishes, then indicate when he wants to continue.)
>
> Is it size? (no)
>
> Color? (no)
>
> Shape? (maybe, yes)
>
> Roundness? (yes)
>
> How would you describe this shape? (curvy, curly, convolute, spiral, etc.)
>
> What is the best word to describe this shape? (spiral)

This is a special kind of spiral discovered by Descarte called the Cartesian spiral.

> (Note: This is the first specific information presented. The student began with a universe of information to choose from and some may have discovered the right answer without the prompts which follow, successively narrowing that universe until the answer was pinpointed.)

Not all spirals are cartesian. Compare the cross section of the shell (Nautilus) with the rope wound around the capstan.

> Does the rope look like a cartesian spiral?
>
> In what respect is the rope different?
>
> Can you put it into words?
>
> (The rope expands by equal increments for each turn; the increments on the shell are much larger on successive turns.)

Good, you can see the difference and describe it! Which of these are Cartesian? Pictures of: (a) spider web; (b) unfurling tip of growing plant; (c) watch spring; (d) mechanical drawing of cartesian spiral.

(The cartesian spirals are (b) and (d); (a) and (c) are not cartesian because they expand by equal increments.)

Now, can you name five examples of the cartesian spiral found in nature? You can choose anything in the universe--plants, animals, the air, water, the heavens.

(As before, the student has time to consider the problem and may or may not come up with some answers. He indicates when he is ready to continue.)

Did you find some spirals in nature? How about the Universe--the heavens--the stars--did you find any here? (spiral nebulae--e.g. Andromeda)

O.K. Let's come down to earth. Did you find any in the atmosphere? (hurricane, tornado, twister, etc.)

How about water? (whirlpool)

Plants? (base of pine cone, unfurling end of fern, etc.)

Animals and fish? (shellfish, snails, etc.)

People? (hair on back of boy's head, colchea near eardrum)

Check your list. Did you get five?

Descartes tried to find a mathematical basis for geometric shapes. He decided that certain forces must be acting to create the characteristic spiral shape.

Could it result from a force acting in one direction only? (no)

How about two forces acting at right angles? (maybe, yes)

Could we resolve the forces acting into two vector forces acting at right angles? (yes)

Might one of these be outward from the center? (yes)

Let's take the pictures seen earlier and overlay the vector forces. The shell would grow straight if the forces were not holding it into center.

What is happening in this whirlpool? (the water would go straight on if it were not pulled to the center of the vortex)

How do you explain the galaxy? (spinning--angular velocity--but exploding outward)

Now, can you describe the forces acting to create the spiral?

Can you name five examples found in nature?

What is the name of this spiral?

Sketch two kinds of spiral and name one of them.

The preceeding sequence could be presented by a teacher before a group, or in tutorial fashion. If could be written with some pictures, audiovisual (programmed instruction) or mediated by a computer (computer assisted instruction). The means is a secondary consideration here since the information is easily presented in any of the different formats. The logical choice is the simplest, least costly method unless some additional degree of automation, flexibility, or control is necessary to achieve the desired result. I have even tried this sequence on television!

Others kinds of information are more critical. Meanings involving motion may require working models, motion pictures, or television, depending on how accessible and how costly the material happens to be. Complex, difficult to learn materials where extensive interation is needed, requires a teaching machine or computer assisted instruction. Simple materials which provoke discussion might best be relegated to the classroom teacher. Obviously, sensory handicaps such as deafness present their own speical learning problems, and any extension of the teacher, as with Dr. Robert Stepp's film loops, or of the environment whether it be a nature film or a visit to the White House seen on television, deserve concentrated use.

In the audiovisual presentation at the conference, specific examples will be presented.

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CHAPTER XI

DISCUSSION SUMMARY

by

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Summary prepared for Symposium on Research and Utilization of Educational Media for Teaching the Deaf, March 17-19, 1969, Lincoln, Nebraska.

Sponsored by the Department of Educational Administration, Teachers College, University of Nebraska, and Media Services and Captioned Films, U. S. Office of Education, Washington, D. C.

DISCUSSION SUMMARY

INTRODUCTION

For the contents of this discussion summary chapter, we are greatly indebted to the Symposium recorders: Dr. John Wiley of the University of Michigan; Dr. Joseph Giangreco of the Iowa School for the Deaf; Norman Anderson of the Wyoming School for the Deaf; and Barbara Beggs of Columbia University. The recorders took notes at all discussion meetings, handled and scrutinized hundreds of comment sheets, and provided the Symposium Editor with nearly forty pages of summary notes. Although, in this summary, lobby and luncheon table comment will be considered relevant discussion, the bulk of the substance of this chapter comes from the recorder notes. Some of the discussion will, of course, touch upon and re-emphasize some of the points made in the various papers, but it is not the objective of this chapter to review the presented papers.

The procedure for organizing this chapter is based upon the rationale that the people who attended the 1969 Nebraska Symposium on the Research and Utilization of Educational Media for Teaching the Deaf will make the major decisions and will to a considerable extent guide and direct future developments in the utilization of individualized instruction for the hearing-impaired learner. Before educators can bring individualized instruction to the deaf child they should have a reason for doing so; then they must be convinced that efforts in this direction are practical and feasible and that sufficient resources are extent to assure at least some measure of success; and finally, they would want a close-up view of some working

4

models. Although the Symposium was not designed within this framework and the conference program was not developed in this particular sequence, the conference papers and discussion cover all these requisites, so that is how the discussion summary is organized. The three major sections of this chapter will be: The Rationale for Decision; Resources for Implementing Individualized Instruction; and Working Models of Individualized Instruction.

It will be noted that some of the discussion was not directly related to the topic of individualized instruction. When a decision was required as to whether a topic of discussion was appropriate for this report, the Symposium Recorders and Editor opted toward the rather broad criterion that almost anything that is relevant to education has some implications for individualization of instruction.

RATIONALE FOR DECISION

If there were no generally-recognized need for reform in the education of the deaf, the Midwest Regional Media Center for the Deaf would not be able to attract 170 educators to a Symposium on Individualized Instruction. People concerned with the instruction of the deaf are generally innovative. Schools for the deaf have established a general climate that has been very receptive to change, and, as a result, many things of a progressive nature have taken place within the past few years. However, common sense dictates that we must be very careful that change does not become an end in itself, that change be directed toward specific goals. In our area of special education it could be possible to end up with the pharmacopoeia of education packaged in new and fascinating bottles, all of which carry the same old labels.

Nobody stated the need for change more clearly and more succinctly than Dr. E. Ross Stuckless when he mentioned that the academic profile of incoming deaf students to the National Technical Institute for the Deaf was spotty and that the preparation of these deaf students for association with the hearing in a highly technical college was straining all of the formidable resources of the National Technical Institute for the Deaf. This can be stated in many different ways, but who will disagree with the broad objective of improving the academic profile of every learner in school programs for the deaf? That, briefly, is what individualized instruction is all about.

Seldom has an educational conference had an opportunity to deliver a stronger one-two punch for innovation than the combination of Dr. Gabriel Ofiesh and Dr. Don Perrin. Coming from opposite ends of the nation, the two speakers presented varied but convergent views on how to improve education. In his presentation Dr. Ofiesh made the comment that much of what we regard as new in education is simply a case of innovators imitating innovators. Both Ofiesh and Perrin, like other speakers on the program, are far in the vanguard of the imitators.

Dr. Gabriel Ofiesh

In his presentation Dr. Ofiesh conceded that in special education we are in the vanguard of innovative developments. However, he added that things are not what they could be and we "are flying an Orville Wright version of education while the rest of the world is walking".

In explaining that a one-to-one teaching situation is not necessarily individualized instruction, Dr. Ofiesh emphasized that individualization is a setting where the classroom teacher or manager structures for the unique needs of the special, individual learner. Learner plans, he pointed out, is not a term that is synonomous with lesson plans. Every learning environment produces a different learning situation for every learner who enters that particular environment; hence, it is not always clear as to what is and what isn't individualized instruction. Group instruction, according to Dr. Ofiesh, can be individualized instruction when:

1. each member of the group can make an individual response.
2. the group is structured to meet specific learning objectives.
3. each student not only brings something to the group but also takes something away.

Much of Dr. Ofiesh's presentation dealt with innovations in general, and discussion naturally followed the same lines. Some of the Ofiesh principles may be categorized as follows:

On Training: Staff training (for individualizing instruction) is more essential than the development of hardware. Teachers in general are less sophisticated in using media than they might be. Teachers in college training programs who say that their students have a sufficient verbal level to make media unnecessary are doing the school students a great disservice. Teachers teach as they have been taught, and at best it will be a long time before schools are properly staffed for individualized instruction. Dr. Ofiesh pointed out that in accepting change younger students with younger teachers have the best success. (To which should be added the often quoted cliche that, for teachers, youth is a state of mind).

On Television: The home is more and more becoming the learning center. Dr. Ofiesh pointed out that a child with limited television experience is considered culturally deprived in spite of the fact that TV is achieving but a small portion of its potential. The time will come when TV will have capabilities for individualization, and learners will borrow videotapes from a resource center in the same way they now loan library books.

On Attitudes: He who blocks the learning of a child is committing a monstrous crime. Dr. Ofiesh repeatedly called for a greater commitment to improved education. The nation he feels, is short-changing its most important resource. The key word for improved instruction is flexibility, not only on the part of the classroom teacher but within all aspects of the educational structure. As a starting point, we should accept the fact that "when students fail to learn, we have failed to teach". Dr. Ofiesh also had a word to say for those people who go over every innovation searching meticulously for flaws in the approach: "Let's not let the best become the enemy of the good, especially when the good is available and the best is not".

Exemplary Programs: Cited by Dr. Ofiesh as exemplary programs in individualized instruction were the Oakleaf Project in Pittsburgh and the effort at St. Scholastica College in Minnesota. Both, he said, were examples of what can be done by dedicated teachers even when funds are limited.

Dr. Don Perrin

Dr. Perrin is a familiar visitor to the Nebraska Symposia, and, as usual, his presentation drew a lively response from the discussion sections. Don is a perfect example of a person who can communicate on many levels, for many reasons, with many people, in many ways. What he told Symposium participants in effect was: It cannot be expected that the type of activities and the innovative approaches to curricula presentation will be readily accepted nor their potential realized without a re-education and eventual evolution of the thinking of those individuals responsible for the child's education.

On Visual Literacy: Dr. Perrin believes that the visual sense provides instant communication. When questioned as to the reason for the large picture in his presentations, Perrin explained the physiological and psychological justification. He prefers to present a large image because a small image is like looking through a window while the large image becomes the environment, rather than a part of it. More students relate to a large picture and learn more from it. Color, Dr. Perrin pointed out, arouses the individual and increases retention. Every effort should be made to make the environment as rich as possible, and for the deaf, the visual environment must be enriched. Perrin justified a visual approach with the question, "Can words explain an Aardvark?"

Dr. Perrin was asked the question of whether it would be possible to measure visual literacy and come up with something in the form of a Visual Literacy Quotient. It could possibly be measured, but actually he thinks we possess very little of it.

On Student Involvement: Dr. Perrin stated that children as youthful as five years old should use a camera and photographic equipment. At all ages he would provide pupils with materials and objectives and let them make all the decisions. Also, on the involvement angle, Dr. Perrin is opposed to the booth or carrel concept of learning. There must, he insists, be contact and interaction---social interaction is a must.

On the Memory Curve: This was mentioned in his presentation and brought up during discussion. Dr. Perrin used the paucity of questions about the memory curve to illustrate the phenomena that immediate recall of irrelevant information is high, the long term recall is low. For more significant information, Dr. Perrin explained, the learner is frequently devoid of immediate arousal while after a period of time the memory tends to recall the information as it relates to meaningful situations.

We need to re-evaluate much of our thinking. Perrin thinks children should be taught to read pictures in the same way they are taught eye movements for reading words. In schools for the deaf there should be less dependence upon verbal presentation. He believes there should be no criterion as to the kind of learning that visual presentation can enhance.

RESOURCES FOR INDIVIDUALIZING INSTRUCTION

The 1969 Nebraska Symposium on Individualized Instruction provided ample evidence that we possess the tools, knowledge, and resources to make individualized instruction a reality for the deaf learner. The major problem seems to be one of concentrating, organizing, and coordinating our efforts.

Dr. James Gallagher

Dr. Gallagher, Assistant Commissioner of Education for the Handicapped, likes to regard the role of the federal government in the education of the handicapped as that of a catalyst. The government has made a commitment to develop the type of educational systems needed by the handicapped youth of tomorrow, and this commitment is both positive and massive.

The extent of this commitment becomes apparent when you consider such things as an annual budget of 100 million for the Bureau of the Handicapped, another 30 million available from the states under P.L. 89-313, fifteen percent of Title III earmarked for the handicapped, and ten percent of Vocational Educational Act funds. All indications are that this financial aid will not only continue but will progressively increase.

Development of educational leadership, according to Dr. Gallagher, holds high priority. Fifty colleges and universities now have training programs for teachers, and the trend is toward strengthening existing programs and raising the overall quality of teachers and educational leaders.

Other developments in the planning stage that were mentioned by Dr. Gallagher in response to questions from the participants indicated that there are plans for five or six early childhood centers to be established across the nation. These centers will be coordinated by the University of Illinois and the first of them will be funded real soon. Dr. Gallagher also mentioned that a quarter of a million dollars has been earmarked for parent education and teacher recruitment.

To the participants Dr. Gallagher also explained the procedures for evaluating proposals submitted to the Bureau of Education for the Handicapped.

Media Services and Captioned Films

The paper presented by Malcolm Norwood gives a brief and interesting review of the varied activities of Media Services and Captioned Films, a branch of the Bureau of Education for the Handicapped. It should be pointed out that the activities of MSCF encompass the entire spectrum of instructional materials, and from the following discussion summary one should not conclude that all services of the agency relate to individualization of instruction. Discussion centering around the Media Sefvices and Captioned Films activities which have a bearing on individualization of instruction is briefly summarized below.

Project LIFE: Materials and programs being developed by Project LIFE are almost exclusively in the domain of individualizing instruction. Most readers of this report will be familiar with the broad efforts of this Media Service and Captioned Films project, and the report of Glenn Pfau at the 1969 Symposium will bring developments up to date.

Dr. Pfau explained that progress in developing Project LIFE materials is accelerating. Most of the delay to date has been caused by two factors: (1) the need to design and develop the appropriate hardware, and (2) the complexities of validating the materials. LIFE now has functional hardware (which was demonstrated at the Symposium) and the materials are currently being evaluated in ten schools. Dr. Pfau stated that, if no unforeseen problems arise, the materials will be available for schools during the 1969-70 school term.

The early decision was to develop Project LIFE Materials for 5-6 year olds, but they now have moved into the 7-8 year level of development. The materials have been developed in units to meet expressive needs of deaf children. The program is divided into units and each unit subdivided into sections, each section having its own specific objective. Some of the problems encountered are due to the following factors:

1. While structural meaning is the greatest challenge, it is difficult to program this aspect because structural signals are not pictorial and possess little meaning in themselves.
2. In determining step size, the problem is in deciding how large the steps should be. Small steps assure learning, but larger steps increase the challenge.

3. Determining the sequence is closely related to step size, and, as any teacher will know, there is little agreement on the sequence of language instruction.

While evaluation of the materials is not final, present evidence indicates that results are favorable. Dr. Pfau cautioned that effective utilization of programmed language instruction remains contingent upon good classroom instruction. The transfer of learning acquired from machines to general language usage is difficult to evaluate.

Mediated Interaction Visual Response: While the overhead projector is generally regarded as a medium for group instruction, Dr. Wyman's MIRV system has implications for individualization. As has been stressed repeatedly, individualized instruction must be supplemented with some form of interaction--pupil-pupil, or pupil-mentor. The MIRV set-up as explained by Dr. Wyman would supply the necessary interaction phase of instruction. In addition, some of the materials developed for this system can be effectively utilized on an individual basis.

Speaking of the system and the materials developed for it, Dr. Wyman explained that the projector is a specially modified Buhl that uses a 150 Watt lamp. Called the Buhl Model 80 MIRV, the Northeast Regional Media Center for the Deaf ordered fifty of them at the cost of about $100 each. In experimental use, the machines have been used in a laboratory setting. When questioned about the desirability of student-student interaction, Dr. Wyman pointed out that the children in the typical setting can, if they need to, see all the screens. The MIRV requires more planning and more careful teacher preparation. Dr. Wyman, firmly believing that there is a place for large group instruction in schools for the deaf, and is currently working on a twelve-station MIRV set-up.

Programmed Instruction: Programmed instruction has been receiving major emphasis at the Southwest Regional Media Center for the Deaf during the past year. Dr. Marshall Hester explained the development of programs for teaching machines that has been demonstrated at previous Symposia. The goal now is to develop a pool of talent to develop the software for the available equipment. To meet this need the Southwest Regional Media Center for the Deaf held a summer institute in programming last year and will have a basic and advanced institute this summer. From these training programs will be developed the skill necessary to develop effective programs. Dr. Hester explained that he has been inviting two people from each school represented in the Institutes. One will be a supervisor and one a classroom teacher, as a team approach is more essential in this type of development. In addition to this programmed learning phase, the Southwest Regional Media Center for the Deaf continues to carry out its usual in-service training, Project Hurdle, and curriculum development activities.

Instructional Television: The Southern Regional Media Center for the Deaf has been specializing in educational television. Dr. William Jackson reported numerous new developments in this area, some of which hold implications for individualizing instruction. The medium of videotapes is bringing a new dimension to the education of the deaf. Of particular interest to Symposium participants was the device for the electronic captioning of videotapes.

There are still unresolved problems in achieving the full potential of television in the classroom for the deaf. One of the needs is standardization of equipment and tapes. Dependability must be improved, and copyright restrictions clarified. Educators of the nead need to determine the most effective purpose of videotape recordings and move ahead in this field.

Programmed Films and Independent Study: Due to the press of time, the Midwest Regional Media Center for the Deaf did not make a report or presentation at the conference; hence, projects of the Lincoln Media Center were not discussed at group meetings. The Midwest Center, however, had some of their materials on display. For the record it should be stated the programmed films produced at Lincoln have been used quite extensively in classrooms for the deaf during the past year. New film programs are in production and validation phases. Dr. Robert E. Stepp, whose enthusiasm for independent study prompted the 1963 Feasibility Study, remains one of the pace-setters in individualized instruction, and, among other things, the Midwest Center will soon complete programs for use on an assortment of teaching machines.

G. H. Rathe, Jr.

In the discussion groups Mr. Rathe, Director of Education for IBM, cleared up many of the points raised in his paper. It is common knowledge that the full potential of programmed instruction cannot be realized without the support of a computer. A fully adaptive, branching type program is possible only when a computer is an integral part of the program hardware. The simple linear programs used in most self instructional devices lack the flexibility to accommodate individual learning differences.

Mr. Rathe emphasized that computer assisted instruction (CAI) is in a relatively primitive stage of development. The potential is formidable, and so are the problems, some of which are:

1. The complexity of a computer hook-up dictates high development costs for programs, and the talent to design programs is very limited.
2. Computers are unable to digitize flowing speech. This problem has not been solved and is one of the major break-throughs being sought.
3. Standardization and compatibility of computer models is needed. Pressure from consumers is needed to accomplish this.
4. Cost of computer equipment is prohibitive for smaller schools. Greater consumer use will drive costs downward, it is hoped.

We need, Mr. Rathe agreed, rapid developments in the field of special education, and to achieve this we must consolidate all of our resources and efforts through the establishment of central facilities and a common language. Several "short-cuts" were suggested. Mr. Rathe suggested that educators of the deaf should look at developments in the military as they are doing the best course planning at this time. Another suggestion was that time be purchased from commercial computers, and courses developed for and by others be adopted. We must move, in the words of Mr. Rathe, in an economical manner toward concerted goals.

WORKING MODELS FOR INDIVIDUALIZED INSTRUCTION

Developments in individualized instruction for the hearing-impaired learner has advanced far beyond the discussion stage. The profession is far from universal or general application, but across the nation there are numerous programs that give first-hand evidence that it works.

Dr. Thomas Behrens

The report of Dr. Thomas Behrens, assisted by Leland Clack and Mrs. Linda Alprin, on the Computer Assisted Instruction project at Kendall School, developed considerable interest among the Symposium participants. The team enumerated some of the successes, as well as the limitations, of the CAI Math program developed by Stanford University and used experimentally with Kendall School students.

Dr. Behrens considers CAI a fascinating tool for teaching math. The programs used at Kendall were highly motivating, and, although the program was still being evaluated, the deaf children seemed to achieve very well. Teachers involved in the project claim that the computer holds attention of the learner much better than similar programs in textbook form. It might be added that the teachers involved in the program were specially selected with adaptiveness being one of the criteria for selection. There was some question as to how rigid teachers would function in programs of this nature. The selected teachers have reacted well and there is something to be said for the benefit of freeing the teacher from tedious drill and practice functions.

The computerized program used at Kendall was essentially a drill and practice program. This imposed some limitations. Success with this type of program is dependent upon effective pre-teaching; the concepts are mastered in the traditional mode of classroom instruction. Another problem was the fact that frequently the reading level was too difficult for the level of computation skills being taught and the cost of modifying the existing programs, according to Dr. Behrens, was far too time consuming.

Computer Assisted Instruction, in the words of Dr. Behrens and his team, is well worth looking into. The cost, it must be stated, has not been too unreasonable, and the Palo Alto hook-up ran to about $750 per month. However, if one were to add development costs to this figure, the per pupil cost becomes rather alarming. It should be noted that a new, more diversified, more highly individualized math program, called STRAND, will soon be available for use with Kendall students. Kendall is also working on a language program of a similar nature.

Robert K. Lennan

There was considerable interest in Robert Lennan's report, because it demonstrated that a high degree of individualization can be developed without sophistry and the related high costs. Mr. Lennan, Director of the Pilot Project at the California School for the Deaf, explained the behavior modification techniques used at Riverside. He explained that of twenty-one children, nine were returned to regular classrooms and that eight of the children showed an improvement of more than eight points in measured I.Q. This is a significant behavioral change and emphasizes the probability that a teacher's or parent's perception of a child is transferred to the child.

The program was based on Frank Hewitt's Engineered Classroom. After identification and diagnosis, the idea was to develop self-identification. Teachers for the project were specially selected and developed a considerable amount of programmed materials. The general procedure was to:

1. Determine skill level of entering behavior.
2. Determine concepts to be taught.
3. List instructional goals in terms of behavioral objectives.
4. Write frames.

The teachers and students in the program made extensive use of cameras, both 35mm and 8mm.

The project overall was very successful and plans are to continue the effort with state support. The 1969-70 program will be for 30 kids and eventual plans are to accomodate 200 educated mentally retarded and emotionally disturbed.

Sam Postlethwait

The Mediated Self-Instruction program developed by Dr. Postlethwait for Botany instruction at Purdue is detailed in his paper (Chapter V of this report). In the discussion sessions Dr. Postlethwait emphasized strongly the role of student involvement in planning the program. The program is constantly being revised and improved, and revision is based upon feedback obtained from students. As determined by student feedback, he has found that what planners originally considered "most important" facts are merely "noise" in the system.

Success of the course is evidenced by fact that enrollment has increased from 380 to 600 and more and more students at Purdue are taking it as an elective. Dr. Postlethwaite feels that he is teaching 50 percent more in the same amount of time. The program is efficient and effective both from student point of view and from the viewpoint of administration and logistics. For 600 students he has one graduate assistant less than he had for 380. The 600 students use half as much lab space as was used for 380, and they use a proportional amount of equipment. The program is being adapted in various forms by eight other departments at Purdue. The course is continually in state involvement. The Blueprint (new edition) is available from Burgess Publishing Company.

Although media makes it possible to structure a program which can be carefully evaluated and improved, Sam is adamant that more than media is needed to make a program like this work. He insists that he doesn't want to be identified with the numerous poor quality audio-tutorial programs now on the market.

Not only have students learned how to learn, but they've learned more, reduced costs, and helped students become more imaginative. The program has been used with under-achievers with startling results---25% A's and 45% B's during second semester.

The most pleasing aspect of the whole thing, according to Dr. Postlethwaite, is that former students now are developing similar programs in high school with equally exciting results.

Dr. John Yeager: The Learning Research and Development Center of the University of Pittsburgh has been engaged in designing an instructional system that would be responsive to the needs of the individual student. The IPI system described by Dr. Yeager is one of the most important developments to be considered when developing plans to individualize instruction for the deaf. The aims of Individually Prescribed Instruction (IPI) are:

1. Provide instruction that is adapted to reliably assessed individual differences among learners.
2. Develop mastery of subject matter as the child moves through the curriculum.
3. Develop self-directed and self-initiated learners through instructural procedures which provide for self-direction.
4. To provide opportunities for the child to become actively involved in the learning process.

Although the IPI materials discussed by Dr. Yeager are being used in 90 schools, he confined his discussion to the Oakleaf Project in Pittsburgh. Indications are that the materials have been successful. Presently packaged for Mathematics, Reading, and Science, indications are that similar materials could be developed for all curricula. Dr. Yeager firmly believes that IPI holds a great deal of promise and that the Oakleaf Project is a step in the right direction; however, he does concede that current developments are but a small beginning and that in the design of materials we are still in the dark ages.

The computer is presently used only for a management function. Eventually, the role of the computer will be expanded to include diagnosis, testing, and instruction.

The objective is to diagnose the needs of the child and prescribe an individualized curriculum. The Pittsburgh Learning Research and Development Center, Dr. Yaeger stressed, are not dissemination people and sources of the materials and information will be found in the appendix of this report.

Dr. Yeager explained that the materials are planned, not necessarily programmed, but that most of the people working on development are experienced programmers. In the setup used, steps are larger and the student has more choice. A unit place test and general testing is used to determine placement of students and a reporting scale is used for evaluation.

Problems are minimal. Some of them are:

1. Scheduling problems have not been solved.
2. Difficult to find personnel who can apply theorėtical knowledge to a learning sequence.

Developments to date indicate a need for continuous study, refinement, and modification. Also needed is the freedom to tryout material, discard, and try again. The effort requires long term developmental work which includes continuous feedback of performance information for improvement of the system. Eventually they hope to arrive at a point where they will have a program that truly accomodates the individual.

The most important thing that can be said for IPI at Oakleaf is that it has obtained overwhelming parent and child support. When students like it, one only has to look at individual students to determine what they need.

CONCLUSION

Individualized instruction is a learning technique that has many facets. Special education should justifiably lead the way in developments in this area, as the eventual goal is toward the ideal of every child being in special education. The concept evolves many changes in the present structure of schools.

Even the basic role of the teacher will be changed. In the new scheme of things the teacher becomes the manager of the learning process, and will no longer, to borrow a phrase from Dr. Ofiesh, be putting last year's galoshes on this year's shoes.

One frequent misconception encountered in discussion was that individualized instruction too frequently is thought of in terms of machine instruction. It is necessary to rethink the whole problem of the role of machines in education. They are, as Omar Khayyam Moore has said, either thought of as mundane tools, or as exotic robots with a nasty disposition. Machines have a role in individualization, sometimes a significant role, but, by the same token, a classroom teacher can move toward individualization without any hardware at all.

Role of teacher training institutions: Before concluding this report, it would be remiss not to report the frequent expression of concern over the role of teacher training institutions in developing individualized instruction. It is generally agreed that training centers have a critical role. One suggestion was that teacher preparation programs be provided material as it is developed, so that graduating teachers would be familiar with the utilization of this material. Corollary to this was the need for college training centers to use individualized instruction in their own instructional programs. The rigidity of programs demanded by accreditation criteria is too well known. One can hardly expect a teacher to be hooked by individualization of instruction unless they have been on the learner's end of it. Another aspect of teacher training frequently mentioned was the need for more aggressive recruitment. We should be seeking excellence.

Enthusiasm generated by the 1969 Nebraska Symposium is evidenced by the number of participants who asked for specifics. The people present repeatedly asked for sources of materials, where they could witness model programs, how instructional programs are scheduled, and things like that. The nature of the questions asked implies that there will be considerable impact on the education of the deaf via follow up activities connected with the 1969 Nebraska Symposium.

The participants returned to their respective schools bearing an important charge. Theirs is the responsibility of determining where technology will lead the deaf learner. Theirs will be the burden of changing our educational structure so that the deaf learner now in school can enter the new millennium to find the horizons of the 21st century filled with the fruits of a successful educational program.

APPENDIX A

SYMPOSIUM

on

RESEARCH AND UTILIZATION OF EDUCATIONAL MEDIA FOR TEACHING THE DEAF

"Individualizing Instruction for the Deaf Student"

National Conference
Sponsored By The
UNIVERSITY OF NEBRASKA
TEACHERS COLLEGE
DEPARTMENT OF EDUCATIONAL ADMINISTRATION
and the
MIDWEST REGIONAL MEDIA CENTER FOR THE DEAF

THE NEBRASKA CENTER FOR CONTINUING EDUCATION

Lincoln, Nebraska

March 17 - 19, 1969

Support for this conference has been provided by a grant from Media Services and Captioned Films for the Deaf, Bureau of Education for the Handicapped, U.S. Office of Education, Department of Health, Education and Welfare, Washington, D. C. 20202

PROGRAM

Monday, March 17, 1969

1:00 p.m. Registration and Coffee, Conference Lobby

2:30 p.m. General Session I, Auditorium
Chairman: Dr. Robert E. Stepp, Director
Midwest Regional Media Center for the Deaf

Welcome: Dr. Robert E. Stepp

Media Services and Captioned Films Reports
Mr. Gilbert Delgado, Chief
Media Services and Captioned Films

Mr. Malcom Norwood, Acquisitions Officer
Media Services and Captioned Films

Dr. Glenn Pfau, Assistant Director
Project LIFE

Dr. Raymond Wyman, Director
Northeast Regional Media Center for the Deaf

Dr. William Jackson, Director
Southern Regional Media Center for the Deaf

Dr. Marshall Hester, Director
Southwest Regional Media Center for the Deaf

Dr. Robert E. Stepp, Director
Midwest Regional Media Center for the Deaf

6:00 p.m. Social Hour, East Hills

7:00 p.m. Banquet, East Hills
General Session II

Chairman: Dr. Frank Withrow, Director
Division of Educational Services
Bureau of Education for the Handicapped

Welcome: Dr. Walter K. Beggs
Dean, Teachers College
University of Nebraska

Educational Futures of the Hearing Handicapped
Dr. James Gallagher
Associate Commissioner of Education for the Handicapped
U.S. Office of Education

Tuesday, March 18, 1969

8:30 a.m. General Session III, Auditorium

Chairman: Dr. Raymond Wyman, Director
Northeast Regional Media Center for the Deaf

A System for Individualizing Education:
Inndividually Prescribed Instruction

Dr. John Yeager
Assistant Director
Learning Research and Development Center
University of Pittsburgh

Planning for Individualized Instruction
of Deaf Students at NTID

Dr. E. Ross Stuckless
Director
Research and Training for NTID
Rochester Institute of Technology

9:40 a.m. Coffee, Conference Lobby

10:00 a.m. Discussion Session I—Rooms and Chairmen

Group A Scottsbluff Room	Dr. Herbert J. Arkebauer University of Nebraska
Group B Norfolk Room	Mr. Bill Blevins The Clarke School for the Deaf
Group C Hastings Room	Mr. Melvin Brasel Minnesota School for the Deaf
Group D York Room	Miss Josephine Carr Oregon College of Education

12:00 noon Luncheon, Omaha Room
General Session IV

Chairman: Mr. George Thompson, Superintendent
Nebraska School for the Deaf

Mediated Self Instruction

Dr. S. N. Postlethwait
Department of Biological Sciences
Purdue University

1:45 p.m. General Session V, Auditorium

Chairman: Dr. William Jackson, Director
Southern Regional Media Center for the Deaf

Computer-Assisted Instruction and its Potential for Teaching Deaf Students

Mr. G. H. Rathe, Jr.
Director of Education
Data Processing Division
IBM

Math Curriculum Supported by Computer Assisted Instruction

Dr. Thomas Behrens, Director
Kendall School for the Deaf
and
Mr. Leland Clack, Math Coordinator
Kendall School for the Deaf

3:00 p.m. Coffee, Conference Lobby

3:15 p.m. Discussion Session II—Rooms and Chairmen

Group A Scottsbluff Room	Dr. Lloyd Graunke Tennessee School for the Deaf
Group B Norfolk Room	Mr. Lloyd Harrison Missouri School for the Deaf
Group C Hastings Room	Dr. Kenneth Huff Wisconsin School for the Deaf
Group D York Room	Mr. Myron Leenhouts California School for the Deaf

6:00 p.m. Banquet, Omaha Room

General Session VI

Chairman: Mr. George Propp, Assistant Director, Instruction
Midwest Regional Media Center for the Deaf

Individualization of Learning and the Necessary Revolution in Education

Dr. Gabriel Ofiesh
Director
Center for Educational Technology
Catholic University

Wednesday, March 19, 1969

8:15 a.m. General Session VII, Auditorium

Chairman: Dr. Glenn Pfau, Assistant Director
Project LIFE

Use of Programmed Instruction with Emotionally Disturbed Deaf Boys

Mr. Robert K. Lennan
California School for the Deaf

Media and Individualized Learning

Dr. Donald Perrin
Department of Instructional Technology
University of Southern California

9:20 a.m. Coffee, Conference Lobby

9:40 a.m. Discussion Session III—Rooms and Chairmen

Group A Scottsbluff Room	Dr. Jean Utley Lehman California State College
Group B Norfolk Room	Dr. William Lenth Montana School for the Deaf
Group C Hastings Room	Dr. Stanley Roth Kansas School for the Deaf
Group D York Room	Mr. Ernest Strong Alabama Institute for the Deaf and Blind

11:45 a.m. Luncheon, Omaha Room

General Session VIII
Chairman: Dr. Marshall Hester, Director
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Summary Reports

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Wyoming School for the Deaf

Barbara Beggs, Research Associate
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Joseph Giangreco, Supt.
Iowa School for the Deaf

John Wiley, Speech Clinic
University of Michigan

Mr. Gilbert Delgado, Media Services and Captioned Films

1:30 p.m. Adjourn

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APPENDIX B

1969

ROSTER OF CONFERENCE PARTICIPANTS

SYMPOSIUM ON RESEARCH AND UTILIZATION OF EDUCATIONAL MEDIA FOR TEACHING THE DEAF

"Individualizing Instruction for the Deaf Student"

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THE NEBRASKA CENTER FOR CONTINUING EDUCATION

Lincoln, Nebraska

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